

20-251E

September 12, 2003

Dr. William Pitts
National Institute of Standards & Technology
100 Bureau Drive-Mail Stop 8662
Gaithersburg, MD 20899-3571

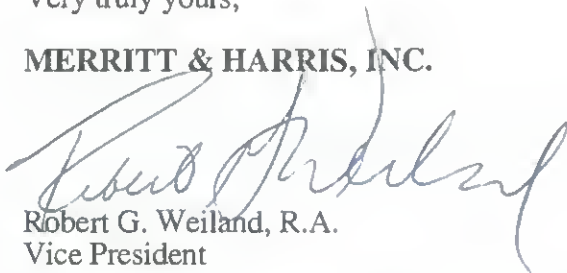
Re: **World Trade Center**
New York, New York

Dear Dr. Pitts:

Transmitted herewith is a complete set of the Merritt & Harris, Inc. photographs included in our Report 20-251E as requested by Mr. Harold Nelson. Permission for this release was granted by Mr. Frank Lombardi of the Port Authority of New York and New Jersey.

Very truly yours,

MERRITT & HARRIS, INC.



Robert G. Weiland, R.A.
Vice President

cc: Port Authority of New York and New Jersey
Attn: Saroj Bhol with Photographs
Attn: Frank Lombardi - Transmittal Only

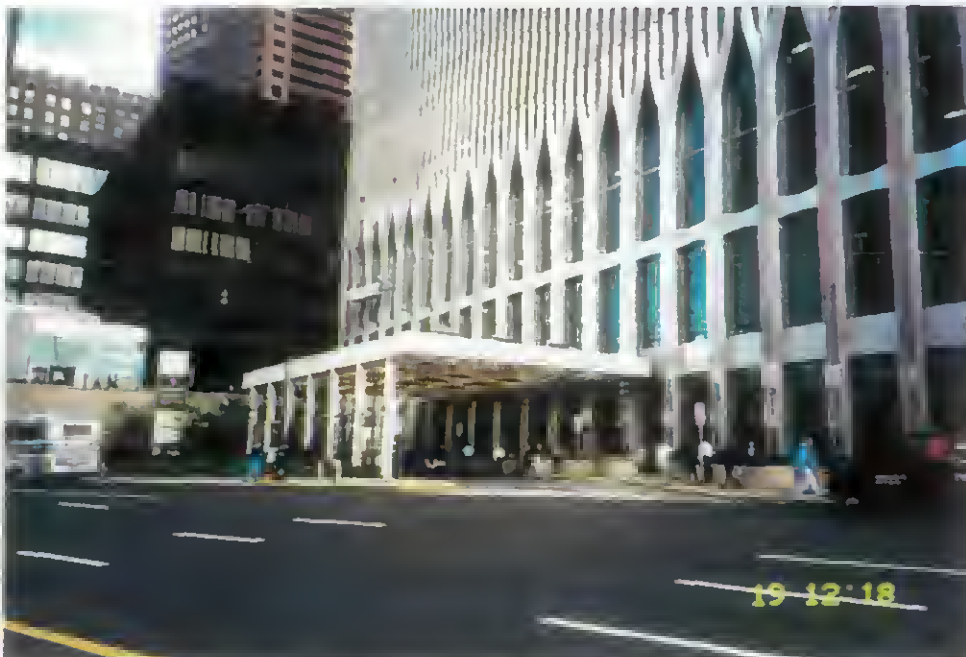
One World Trade Center

World Trade Center
New York, New York



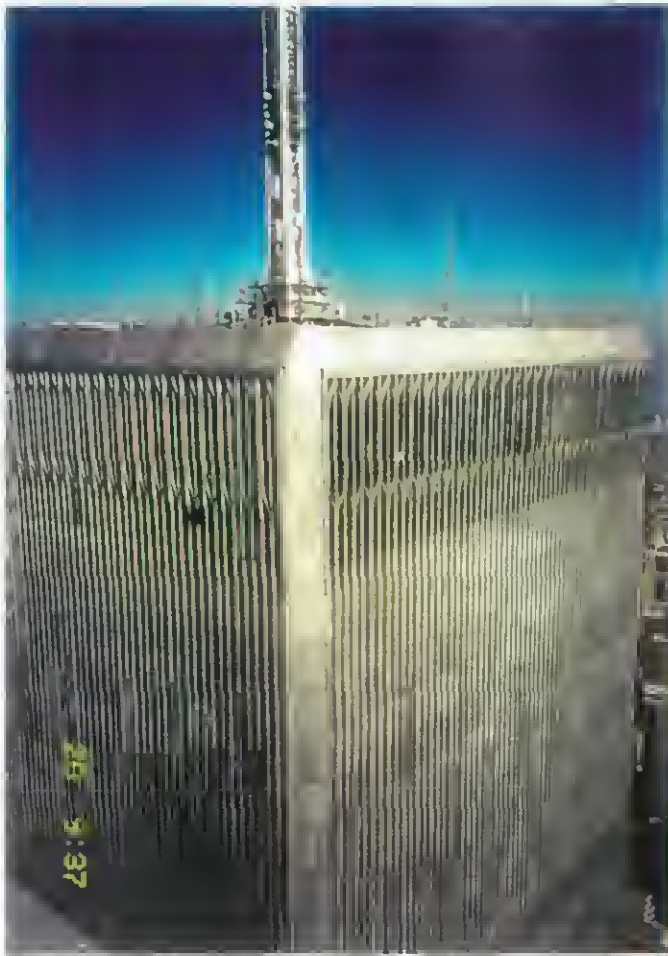
Photograph 1

Front plaza level
entrance (east)



Photograph 2

West Street Entrance
to Lobby



Photograph 3

Rooftop and antenna

X



Photograph 4

Antenna

One World Trade Center

World Trade Center
New York, New York

Photograph 5

Window washing rig



X

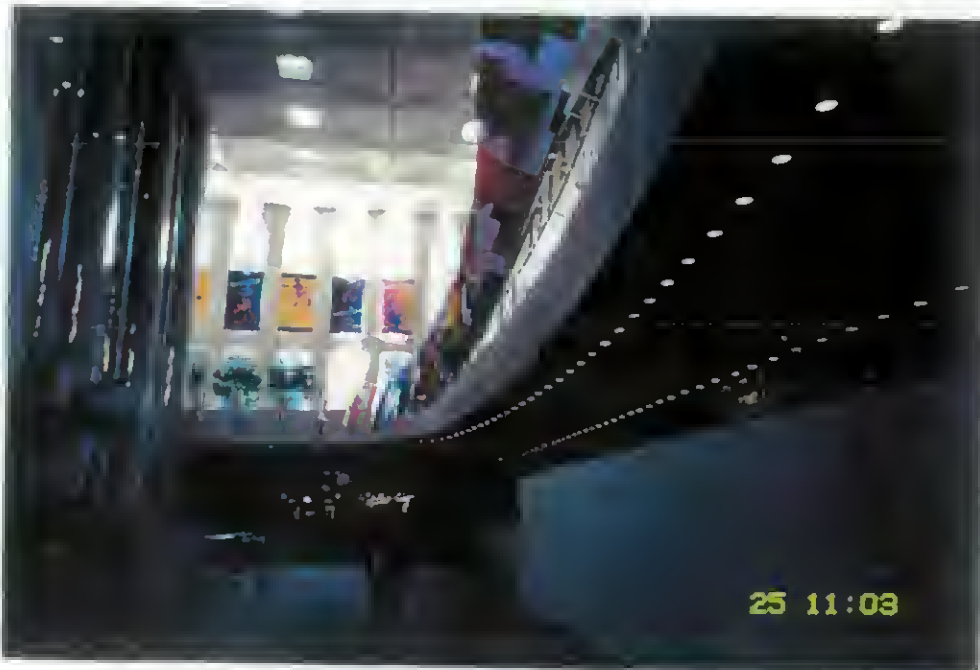
Photograph 6

Typical setback at
MER levels



One World Trade Center

World Trade Center
New York, New York



Photograph 7

Lobby with plaza
level mezzanine
above



Photograph 8

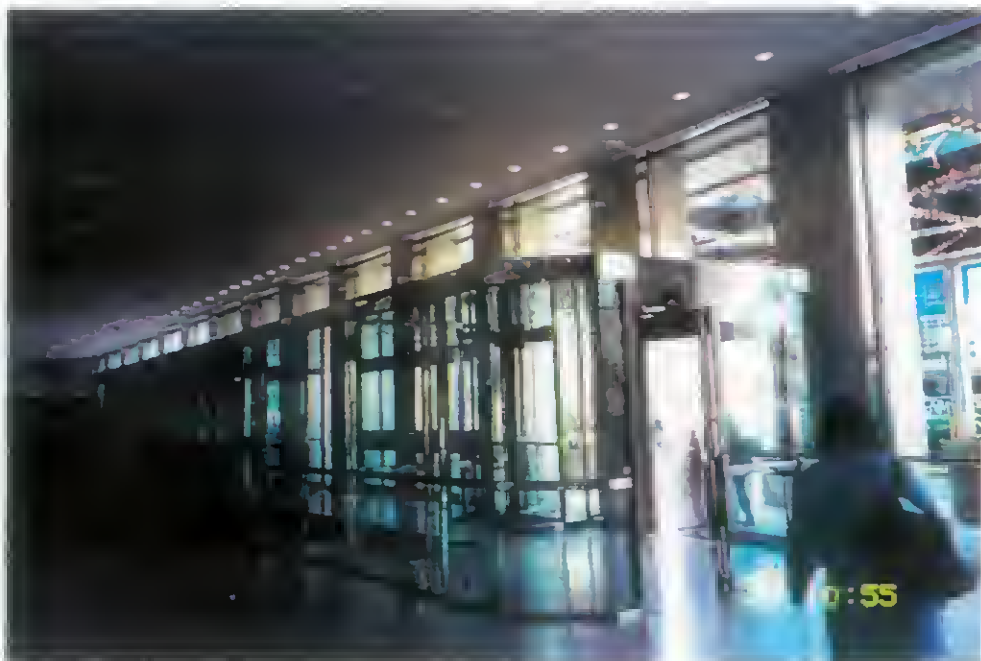
Lobby and elevator
banks



Photograph 9

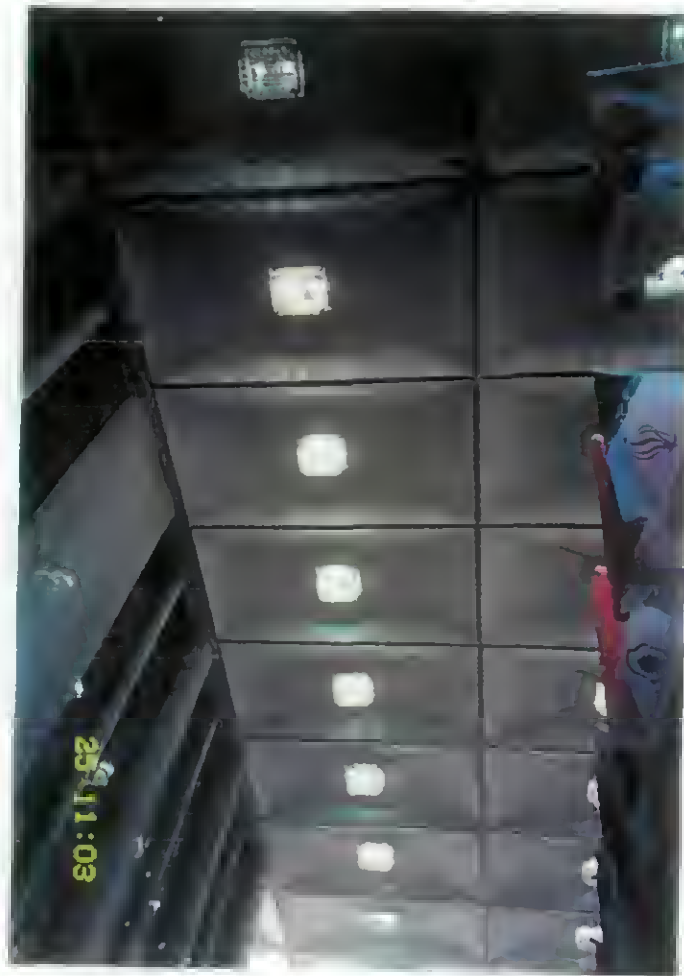
Lobby entrance
from mall, and
escalators to
mezzanine

X



Photograph 10

Lobby entrance and
vestibule on West
Street



Photograph 11

Lobby suspended
plaster ceiling panels

X



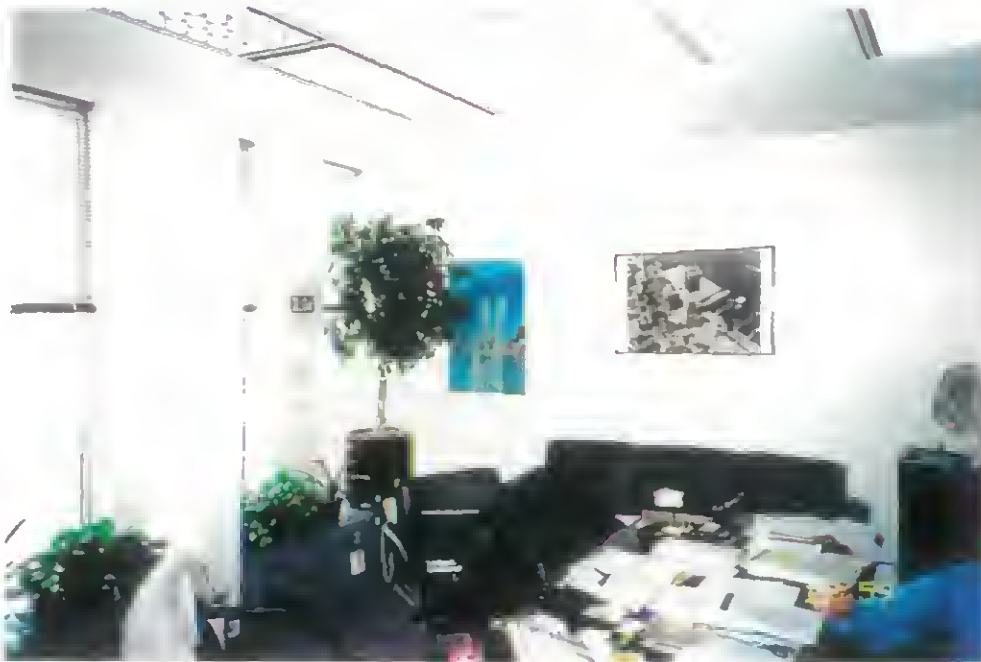
Photograph 12

Typical multi-
tenanted floor
corridor



Photograph 13

Typical multi-
tenanted floor
elevator vestibule



Photograph 14

Typical office

One World Trade Center

World Trade Center
New York, New York



Photograph 15

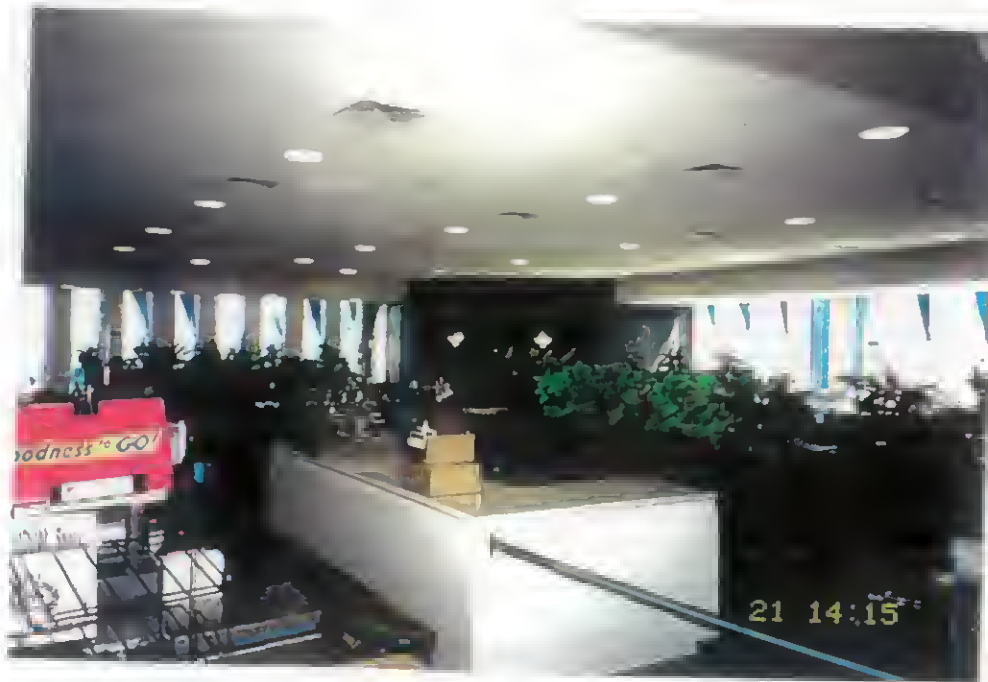
Vacant space

X



Photograph 16

Windows on the
World rest room



Photograph 17

Port Authority
Cafeteria on 43rd
floor

X



Photograph 18

Port Authority
Cafeteria on 43rd
floor



Photograph 19

Upgraded toilet
room

X



Photograph 20

Elevator vestibule
Level B3 for garage



Photograph 21

Bent stair nosing on
wide stairs.

X



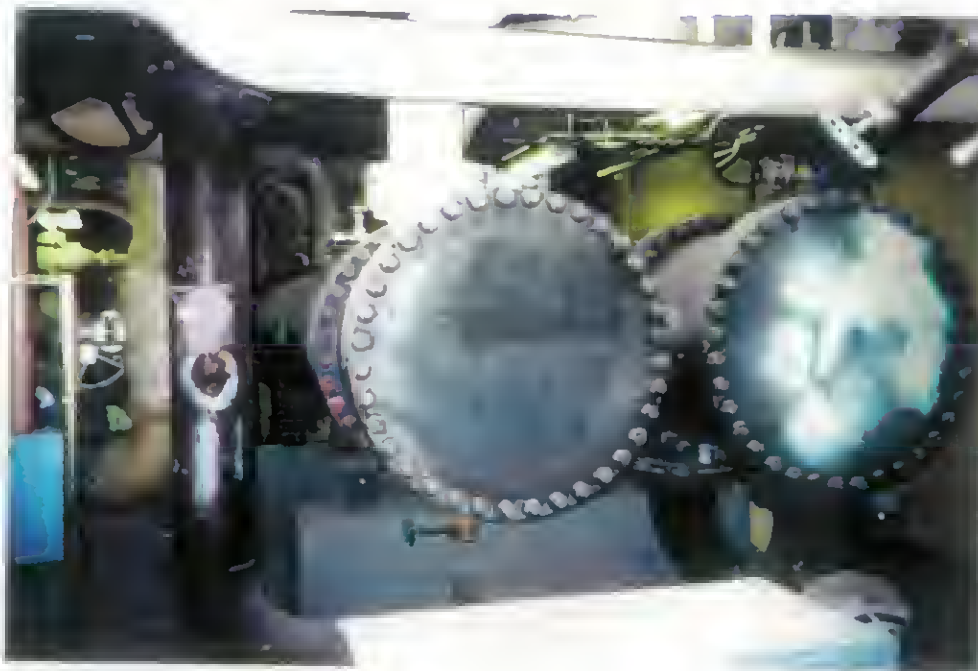
Photograph 22

Viscoelastic damper
at each floor joist.



Photograph M1

Condenser water
system #2 pump



Photograph 2

Condenser water
system #2 heat
exchangers



Photograph M3

**New condenser
water system #2
pump and plate
and frame heat
exchanger**

X



Photograph M4

**New freeze
protection
system chilled
water pumps**



Photograph M5

480 volt and 208
volt electric bus
duct risers
located in a
typical electric
closet



Photograph M6

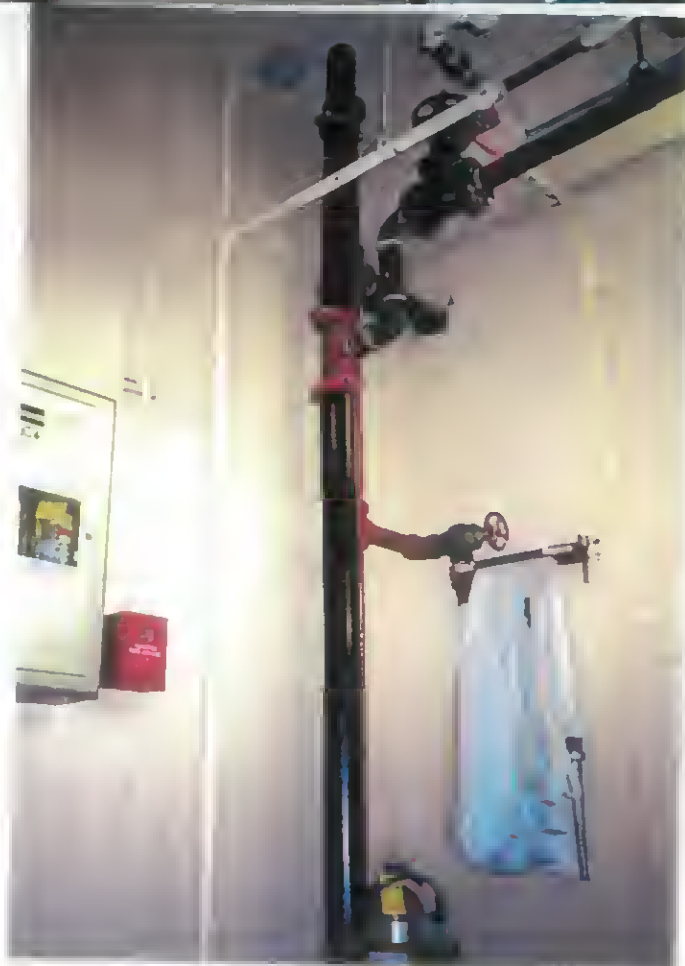
5,000 gal.
standpipe fire
reserve tank



Photograph M7

Typical floor
sprinkler control
valve room with
sprinkler supply
line and flow and
tamper switches

X



Photograph M8

Standpipe riser
with a fire hose
rack, and fire
extinguisher
cabinet located
in the stairs



PhotographM9

Typical office
floor corridor
with an exit sign,
manual pull
station, fire
warden station,
and audio/visual
alarm

X



Photograph 1

Liberty Street
elevation



Photograph 2

Liberty Street
entrance to Lobby

Two World Trade Center

World Trade Center
New York, New York



Photograph 3

Plaza elevation,
Marriott hotel in
background



Photograph 4

Rooftop observation
deck, window
washing rig

Two World Trade Center

World Trade Center
New York, New York



Photograph 5

Entrance to rooftop
observation deck;
note concrete
covered roof

X

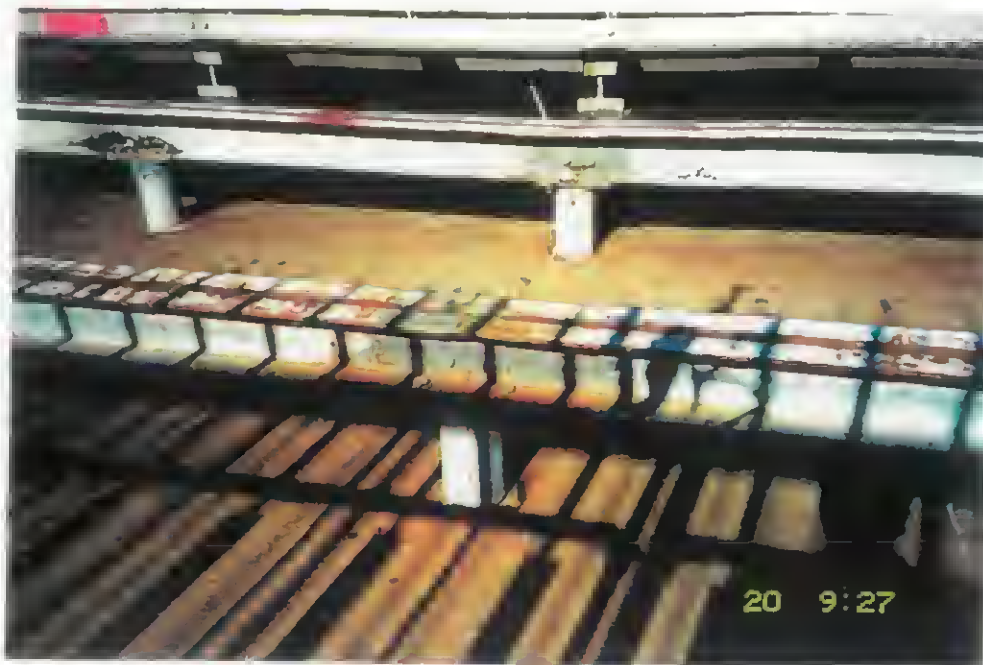


Photograph 6

Helicopter pad

Two World Trade Center

World Trade Center
New York, New York



Photograph 7

Rusted window
washing rig rails

X



Photograph 8

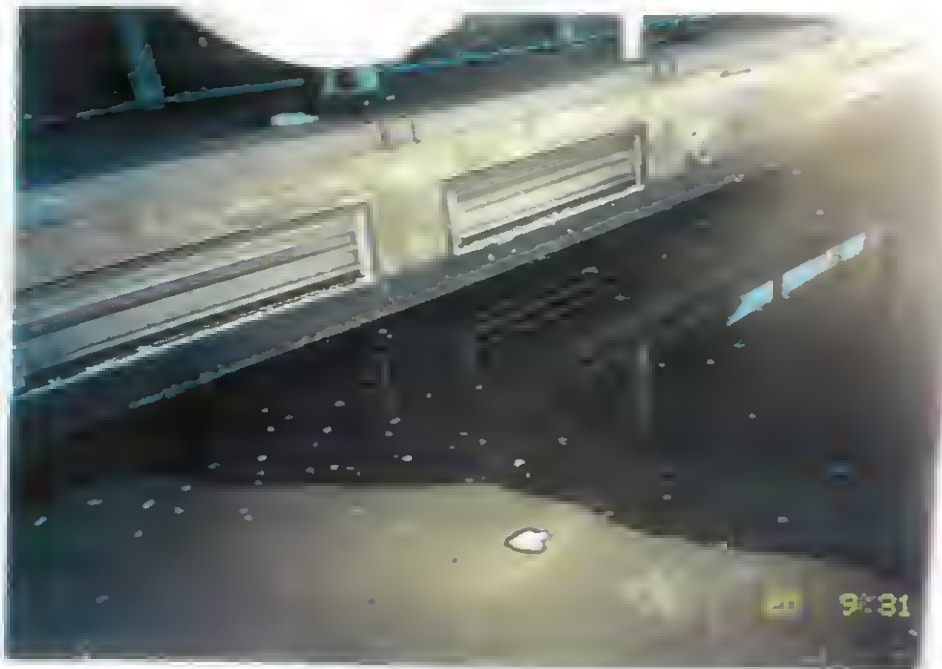
Rusting purlins for
exposed facade at
110-story and at
roof

Two World Trade Center

World Trade Center
New York, New York

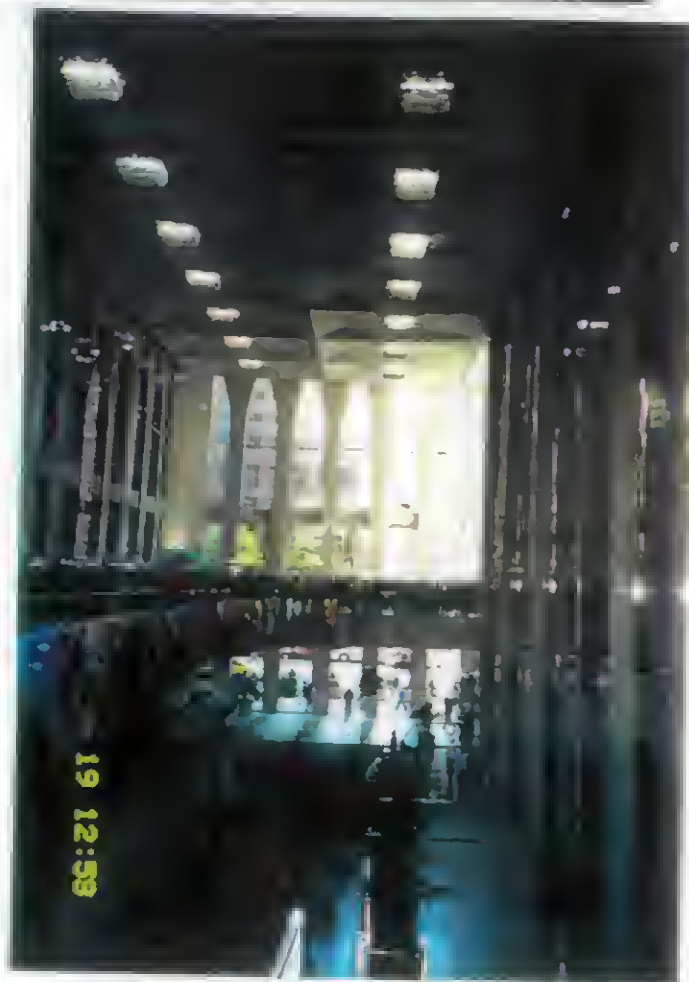
Photograph 9

Puddles at main roof
indicate poor
drainage



Photograph 10

Lobby and
mezzanine





Photograph 11

Lobby - visitors desk
on left, security gates
to elevators on right

X



Photograph 12

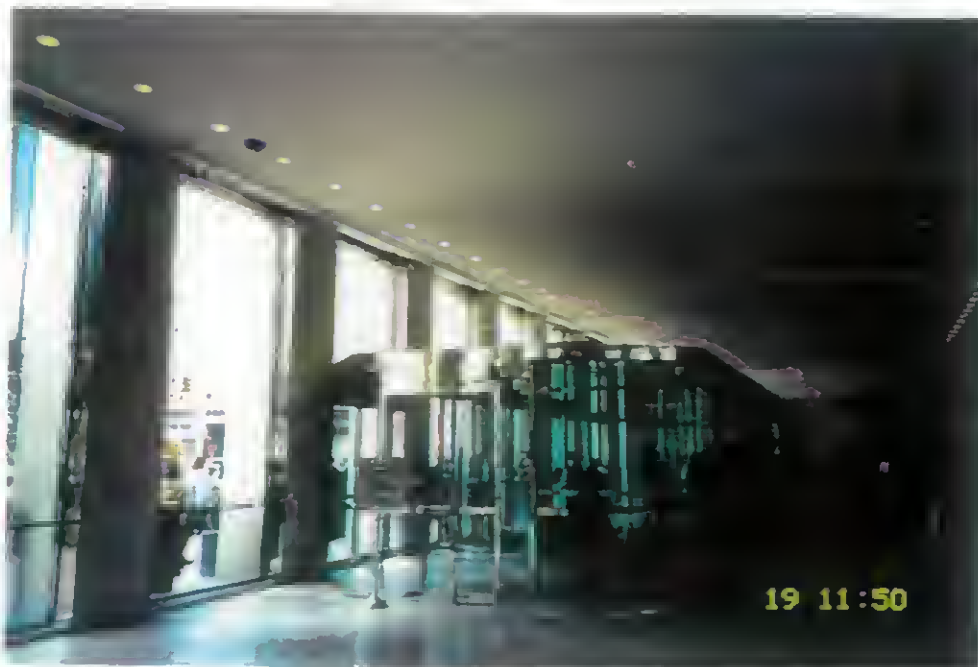
Lobby, secured
entrance to elevators
to garage on right



Photograph 13

Vacated desks in
lobby

X



Photograph 14

Lobby and vestibule
entrance from
Liberty Street

Two World Trade Center

World Trade Center
New York, New York



Photograph 15

ADA accessible
entrance from mall



Photograph 16

Typical sky lobby



Photograph 17

**Typical multi-tenant
elevator vestibule**



Photograph 18

**Typical toilet room
with original finishes**



Photograph 19

Observation deck
cafeteria



Photograph 20

Observation deck
eating area



Photograph 21

Typical floor office
interior



Photograph 22

Viscoelastic damper
at each floor joist



Photograph 23

Typical floor
framing system after
fireproofing
respraying

X



Photograph 24

Upgraded elevator
lobby, by tenant



Photograph M1

Typical 7th floor
mechanical room air
handler and
abandoned freeze
protection pump
system

X



Photograph M2

New air handling
unit for the
electrical
substation on the
74th floor



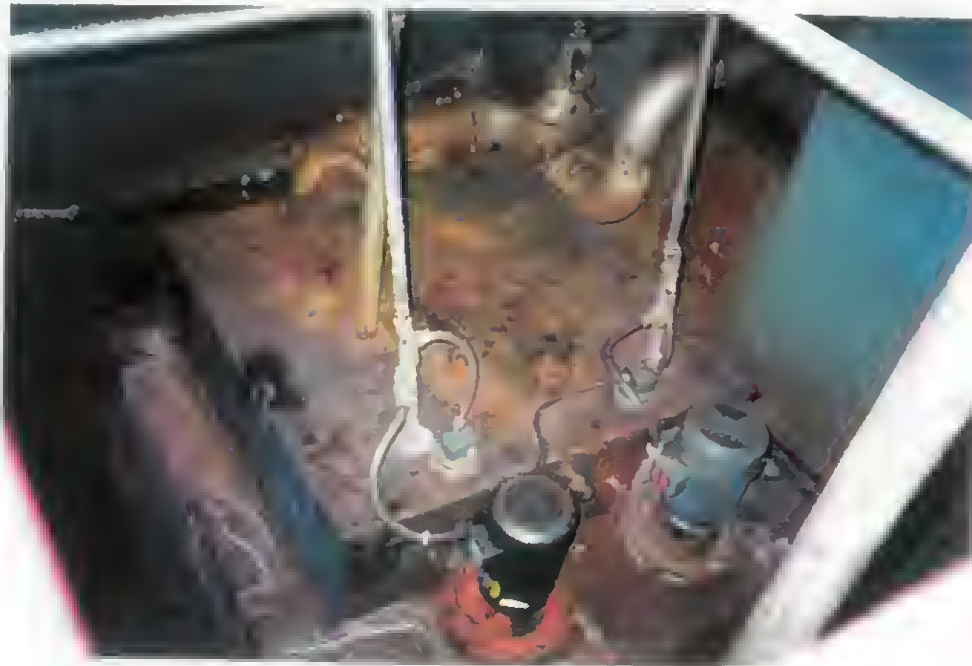
Photograph M3

**Steam pressure
reducing station**



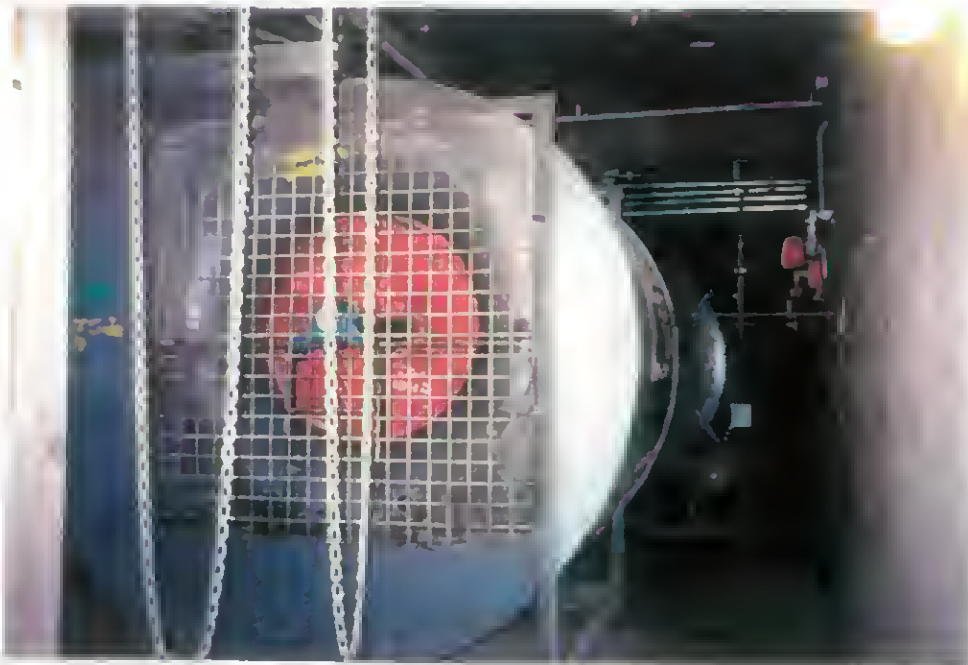
Photograph M4

**Steam and
chilled water
heat exchangers
and secondary
heating/chilled
water pumps**



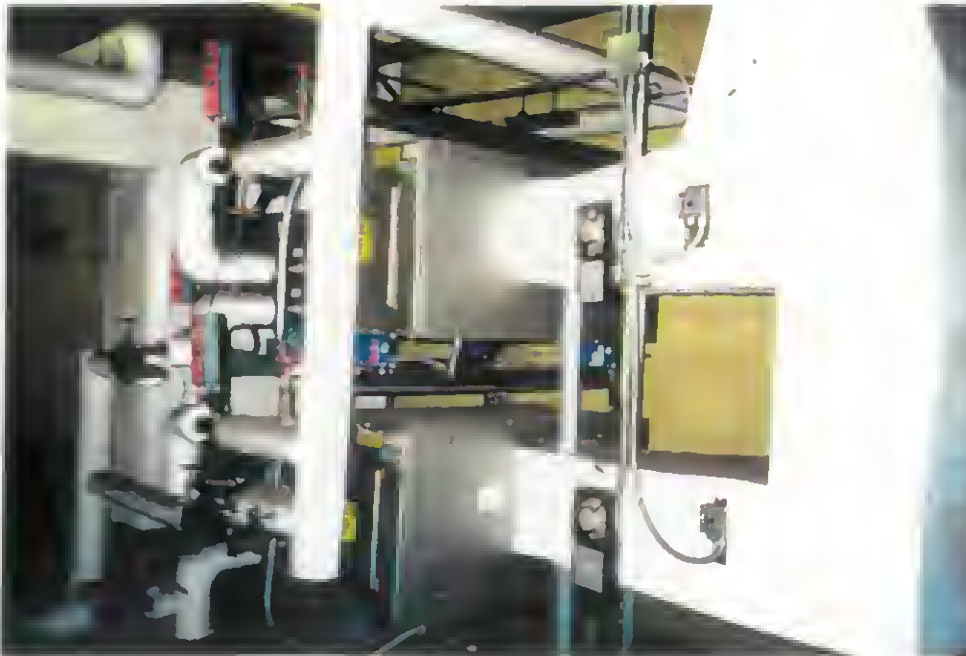
Photograph M5

**Steam
condensate
return pumps
and receiver in
the B-6 Level
mechanical room**



Photograph M6

**7th floor
mechanical room
air handler
return air fan**



Photograph M7

New H&V units,
with steam coils,
located in the B-6
Level mechanical
room

x



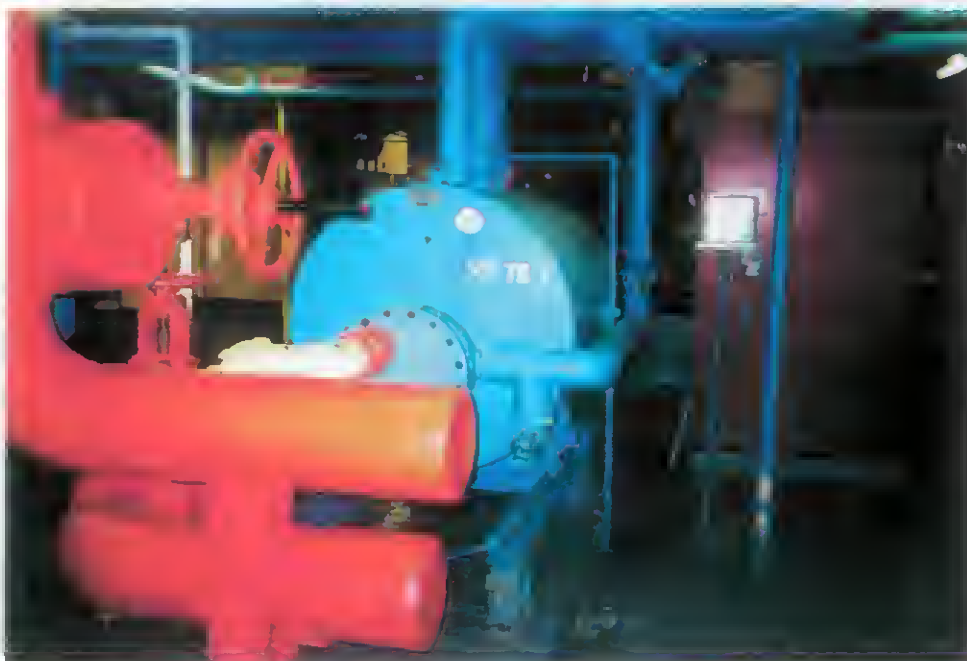
Photograph M8

Domestic water
pressure
reducing station



Photograph M9

**Domestic water
booster pump**



Photograph M10

**Domestic water
preheat tank**



Photograph M11

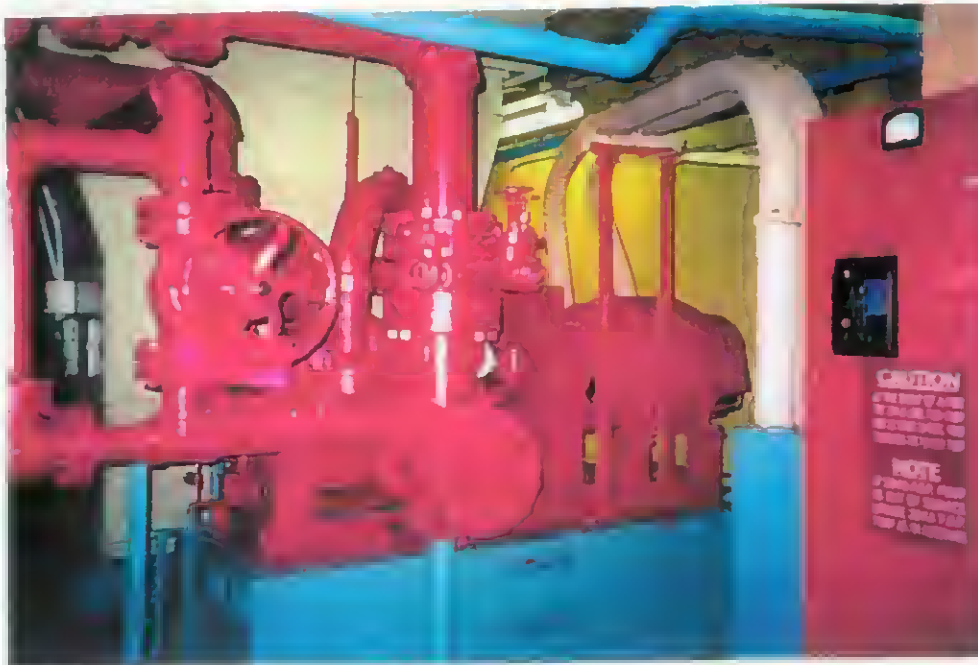
Steam and
electric domestic
water heaters
and circulating
pumps

X



Photograph 12

Large electric
water heater



Photograph M13

**Electric fire
pump located in
the 7th floor
mechanical room**

X



Photograph M14

**Standpipe riser
with a fire hose
rack and fire
extinguisher
cabinet located
in the stairs**



Photograph M15

**Fire alarm
panels for the
new system being
installed**



Photograph M16

**Duct smoke
detectors for a
typical air
handler**



Photograph M17

**Exit sign, manual
pull station, and
alarm**

X



Photograph 1

Austin Tobin
Plaza looking
southwest

X



Photograph 2

Sidewalk, curb,
and planter
details on
sidewalk looking
west along Vesey
Street



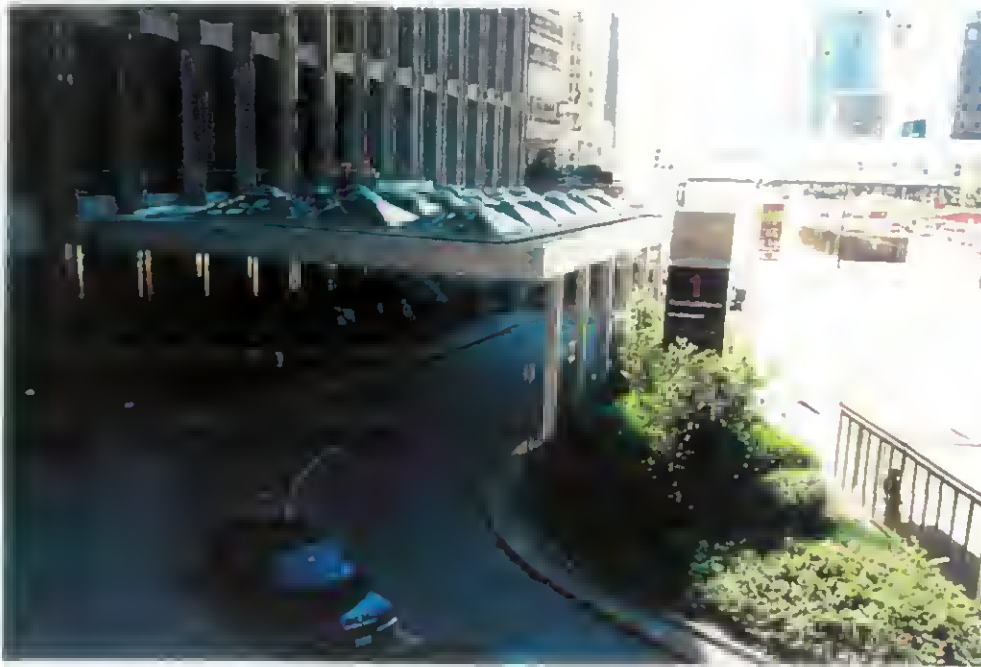
Photograph 3

**Sidewalk
conditions along
Vesey Street near
West Broadway**



Photograph 4

**Sidewalk
replacement in
progress West
Street near
Customs House**



Photograph 5

**Vehicular drop
off at entrance to
1 WTC on West
Street**



Photograph 6

**Typical granite
stairway from
Plaza between
WTC 1 and hotel**



Photograph 7

**Street furniture
and pavement
south of WTC 2
along Liberty
Street**



Photograph 8

**New granite
pavement south
at 2 WTC
entrance**



Photograph 9

Sidewalk and
steps south of 4
WTC at Liberty
and Church
Street



Photograph 10

Street furniture,
planters, and
tree wells along
Church Street at
4 WTC



Photograph 11

**Ramped
entrance from
Church Street
looking west into
Tobin Plaza**

X



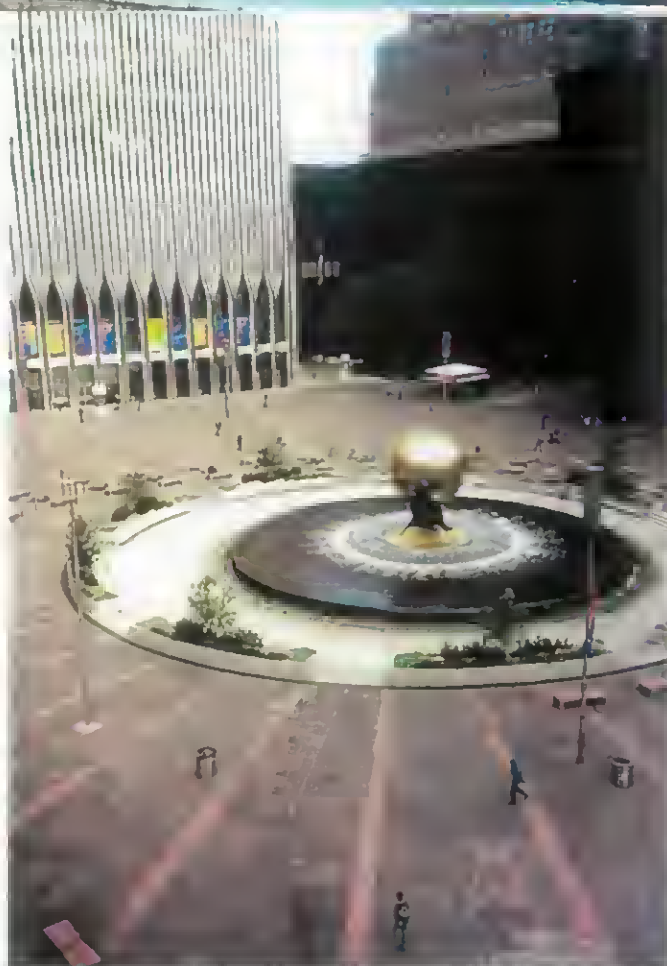
Photograph 12

**Church Street
steps entering
Plaza**



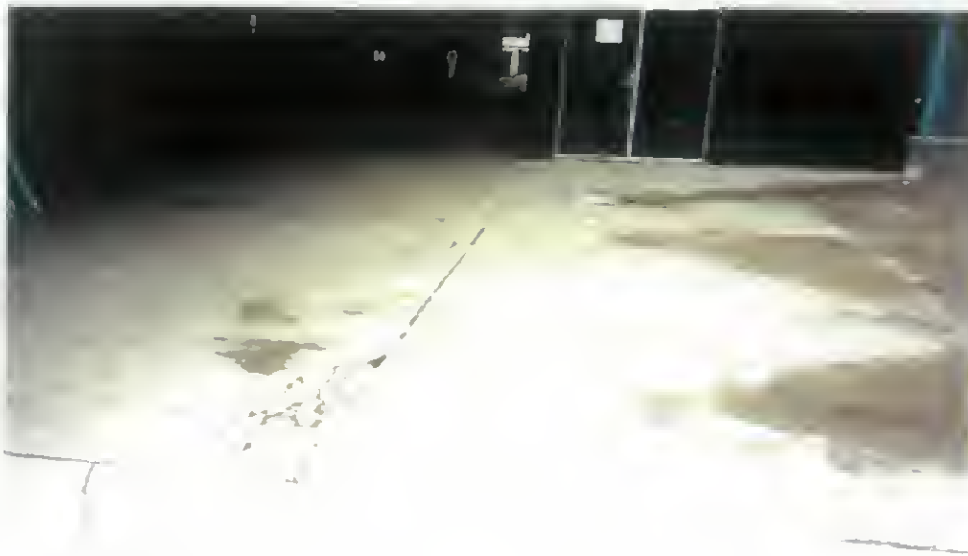
Photograph 13

**Sculpture at
entrance to Plaza
on Church Street**



Photograph 14

**Overview of
Plaza from
4WTC**



Photograph 15

**Damaged Plaza
pavement under
overhang for 4
WTC**



Photograph 16

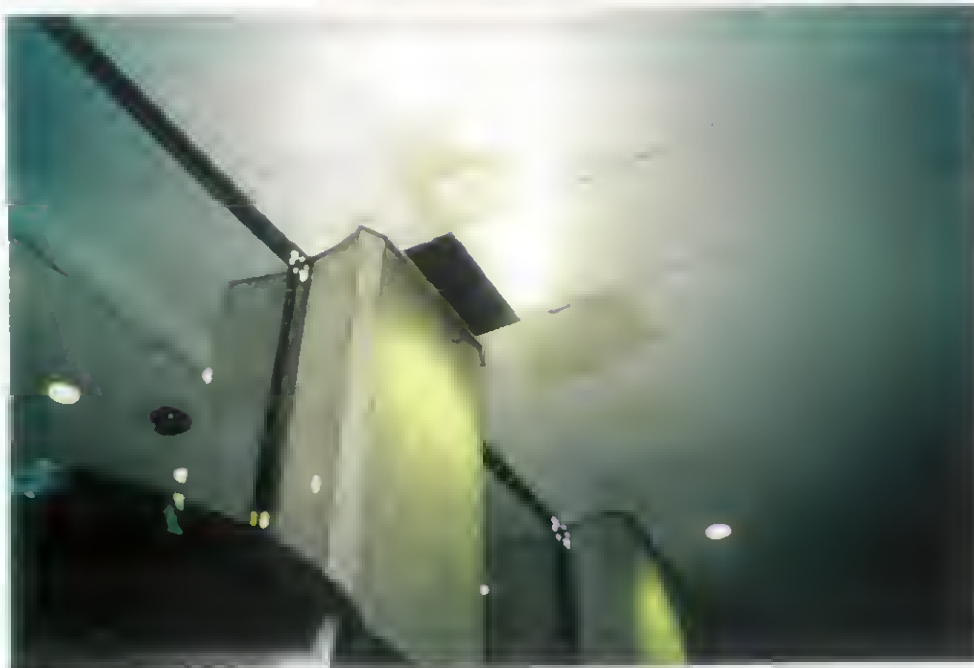
**Planter damage
at Plaza level
near 4 WTC**



Photograph 17

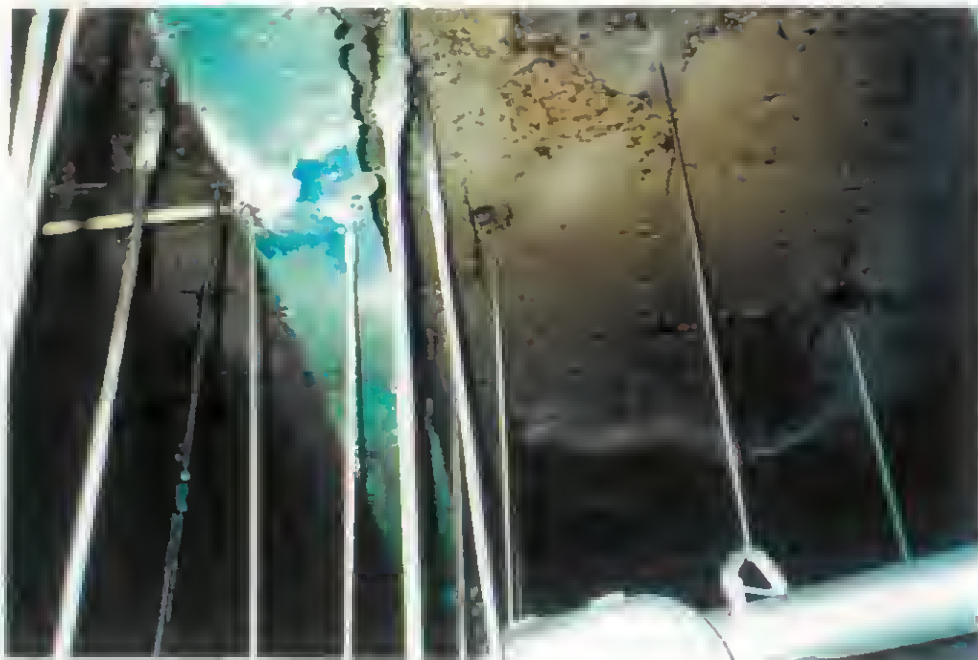
**Expansion joint
in Plaza deck
along east side
near Church
Street**

X



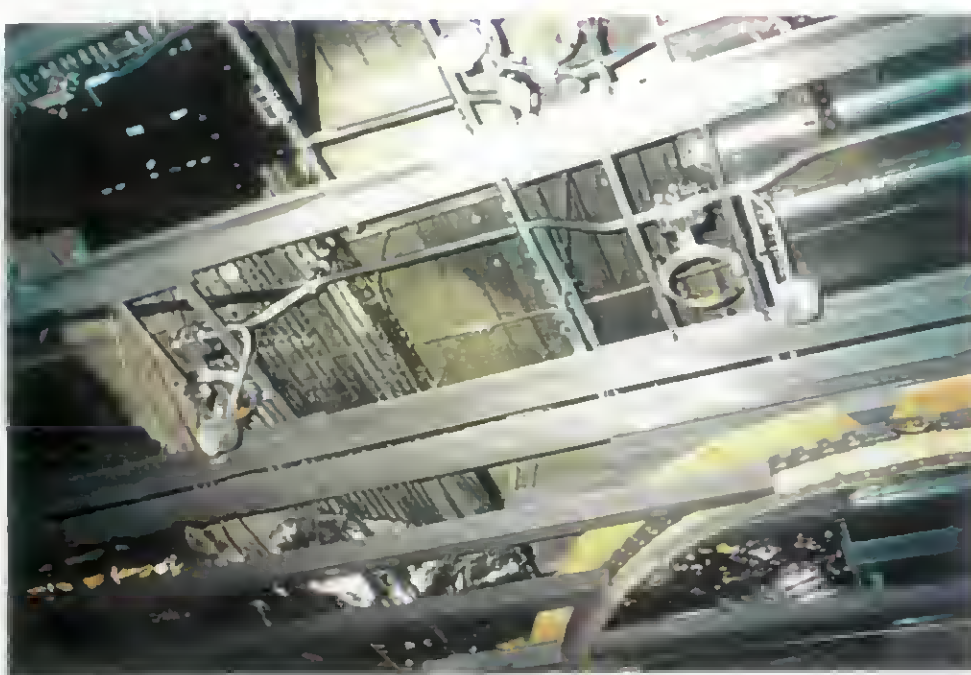
Photograph 18

**Leaks at
underside of
Plaza deck
visible near 1
WTC entrance**



Photograph 19

Structure of
Concourse level
visible from 4
WTC mechanical
room on B1 level



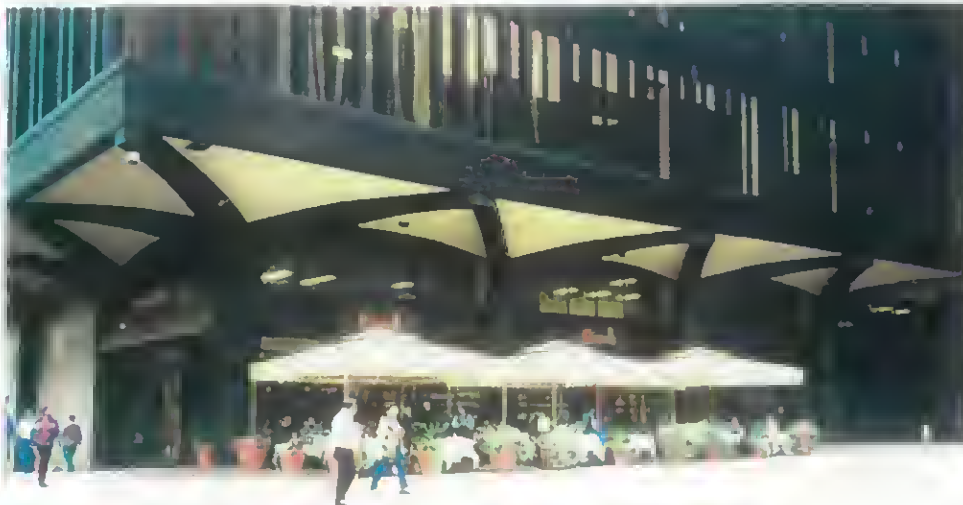
Photograph 20

Metal deck and
framing for
Plaza level
visible from
construction
area in
Concourse level



Photograph 21

Steel framing
and metal deck
for 3rd Floor
framing visible
in vacant retail
space at 4WTC
Plaza level



Photograph 22

Exterior finishes
and space under
overhang being
used for
restaurant
seating



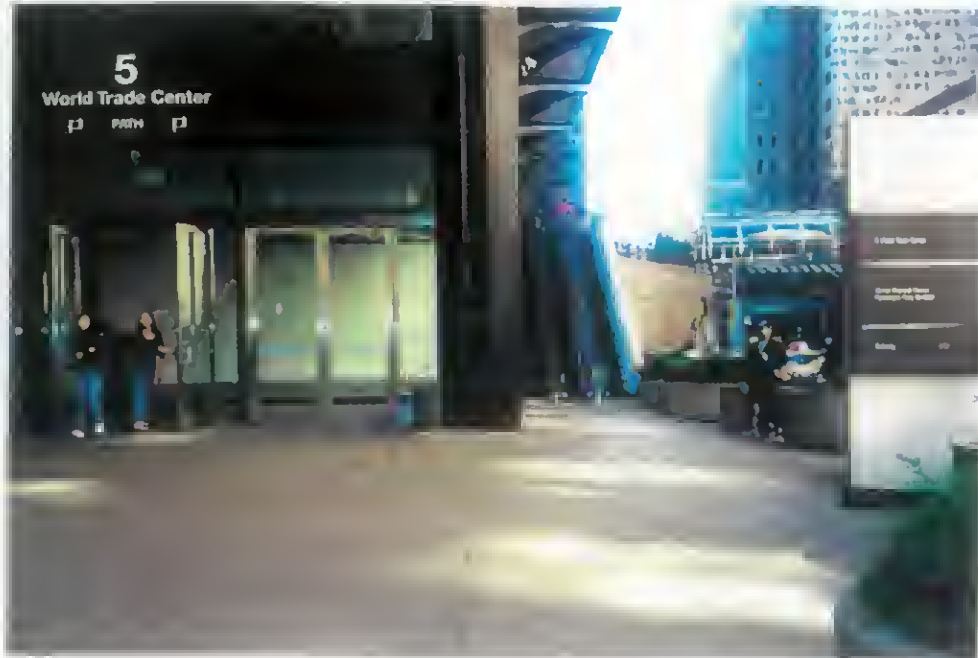
Photograph 23

Detail of exterior
structure and
finishes at 5
WTC



Photograph 24

Doors to
northeast
building
entrance occur
on a level
between the
Concourse and
the Plaza



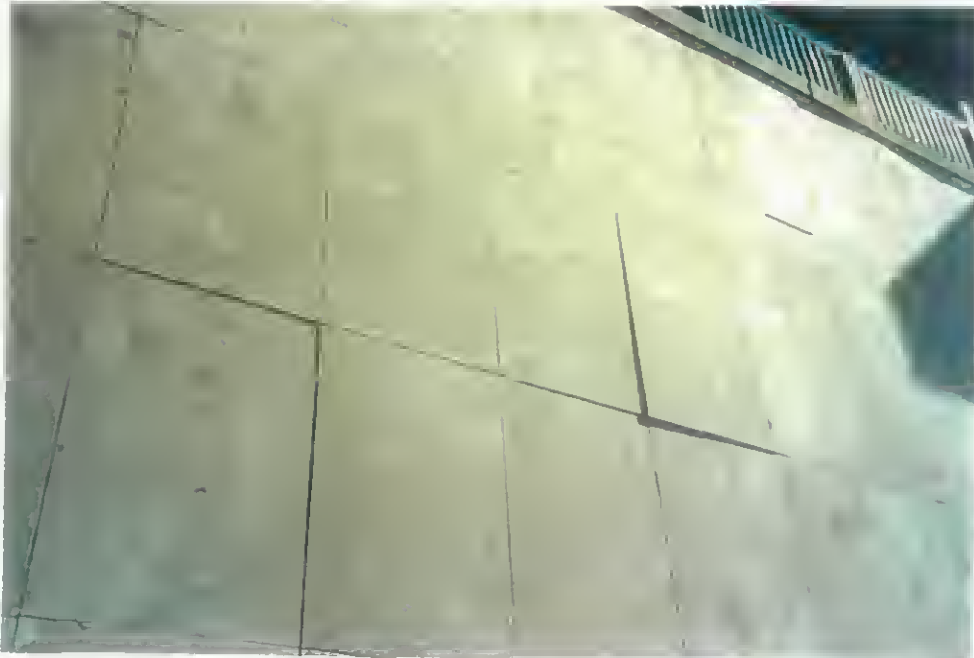
Photograph 25

Mall entrance
detail along
Vesey Street –
Note exterior
escalators to
Plaza level on the
right



Photograph 26

Retail showcase
windows at
Liberty Street
side



Photograph 27

**Example of
displaced marble
panels to be
monitored for
further
movement**



Photograph 28

**Damaged marble
panel near
bottom of
exterior stairway
between 1 and 4
WTC**



Photograph 29

Central area of
Concourse level
at head of PATH
escalators



Photograph 30

Old travertine
flooring in an
area scheduled to
be replaced with
terrazzo



Photograph 31

New terrazzo flooring in the north Concourse corridor looking west towards 1 WTC

X



Photograph 32

New terrazzo flooring in west corridor looking south towards 2 WTC



Photograph 33

South corridor
with original
finishes looking
east from 1 WTC

X



Photograph 34

Intersection of
south and east
corridors with
original finishes



Photograph 35

Central corridor
looking north
towards PATH
entrance area



Photograph 36

Central corridor
looking south
toward Liberty
Street entrance



Photograph 37

Detail of Liberty
Street entrance
doors with ADA
features on left



Photograph 38

Stairway and
escalators at
southeast
building
entrance



Photograph 39

**Lobby to 4 WTC
at Concourse
level is from the
retail mall area**



Photograph 40

**East corridor
looking north**



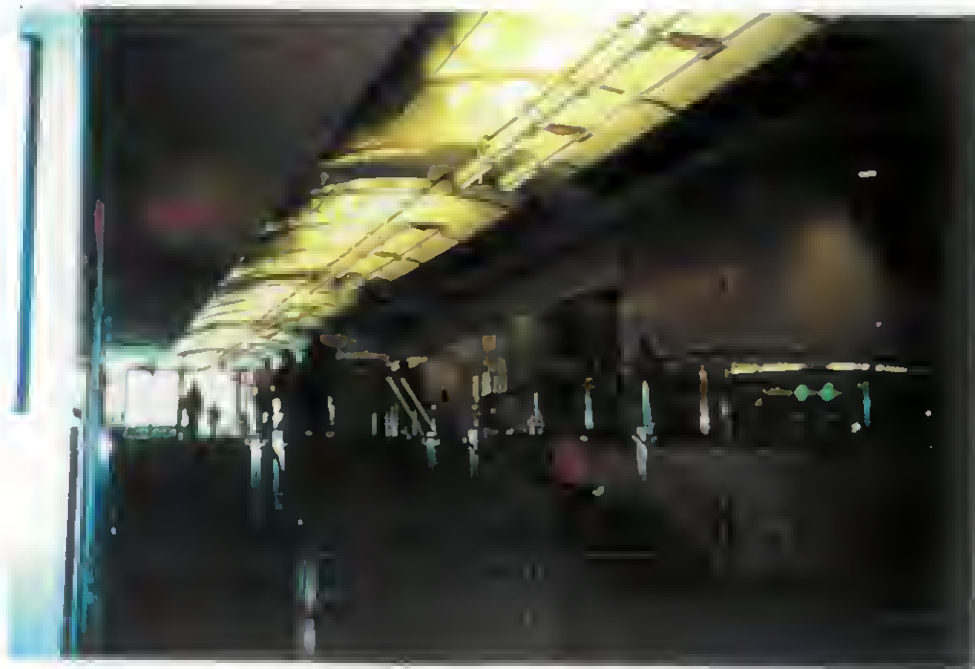
Photograph 41

Central corridor
looking west



Photograph 42

North corridor
looking east



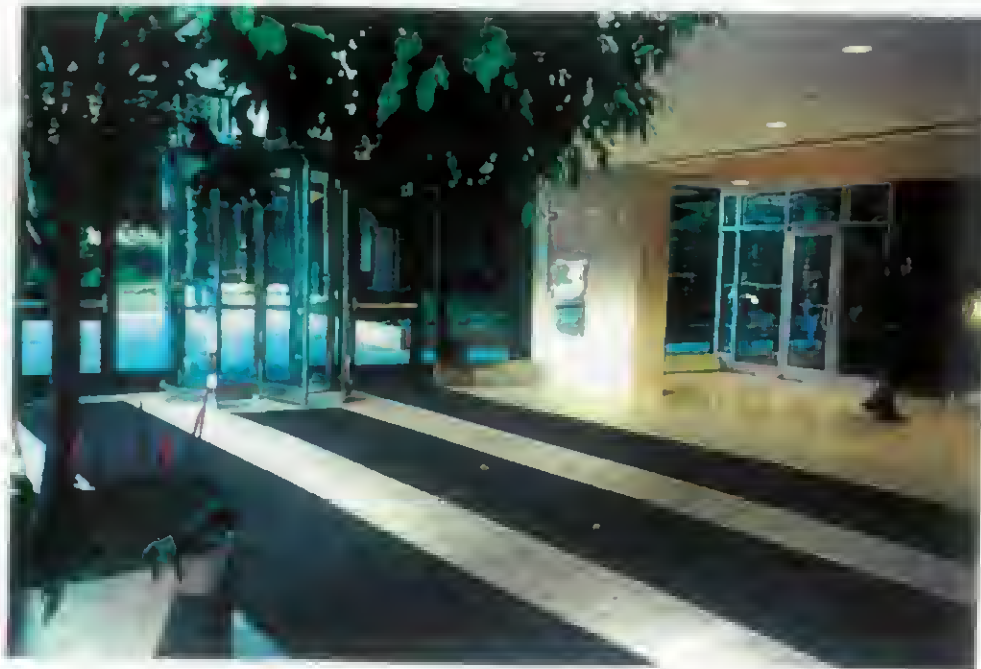
Photograph 43

5 WTC lobby is
accessed by
stairway and
ADA ramp from
mall at
Concourse level



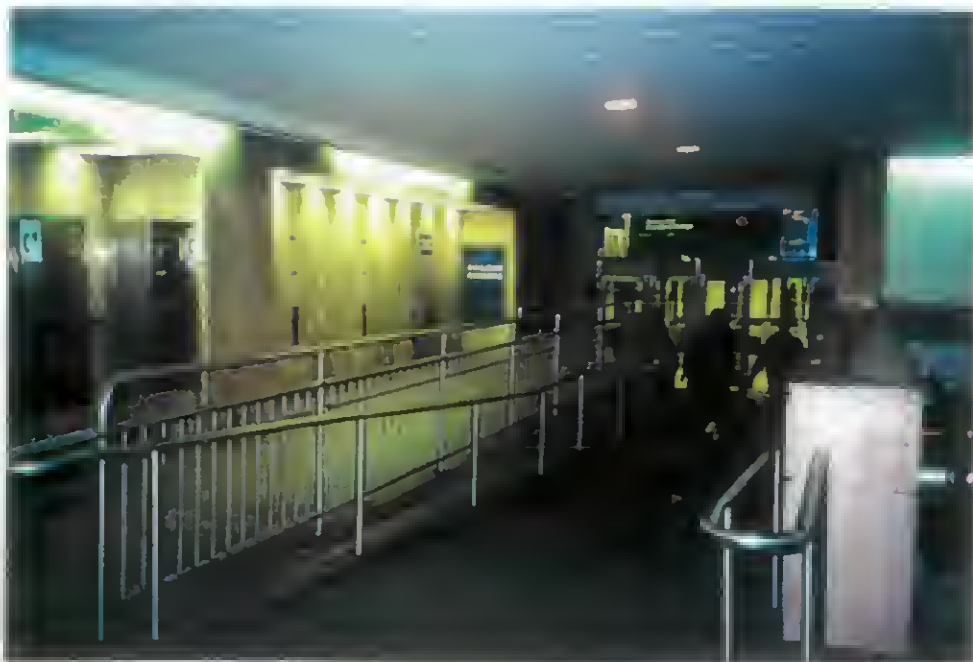
Photograph 44

Grade level
entrance at
northwest corner
of complex
occurs between
Plaza and
Concourse levels
below the 5 WTC
building



Photograph 45

**Entrance from
Plaza side at 5
WTC**



Photograph 46

**Entrance to NYC
subway system
from eastern
corridor**



Photograph 47

**Vacant retail
space at Plaza
level below 4
WTC**

X



Photograph 48

**Change in level
in retail space
Plaza level below
4 WTC**



Photograph 49

**Rear service
corridor at
Concourse level
east side**

X



Photograph 50

**Elevator lobby at
4 WTC 3rd Floor**



Photograph 1

Entrance pylon
at Church Street
Plaza entry



Photograph 2

Existing
structure below
building at B-2
level remaining
from PATH
station



Photograph 3

Typical building
structure with
30' column bays,
cantilever at
perimeter, steel
framing and
metal deck

X



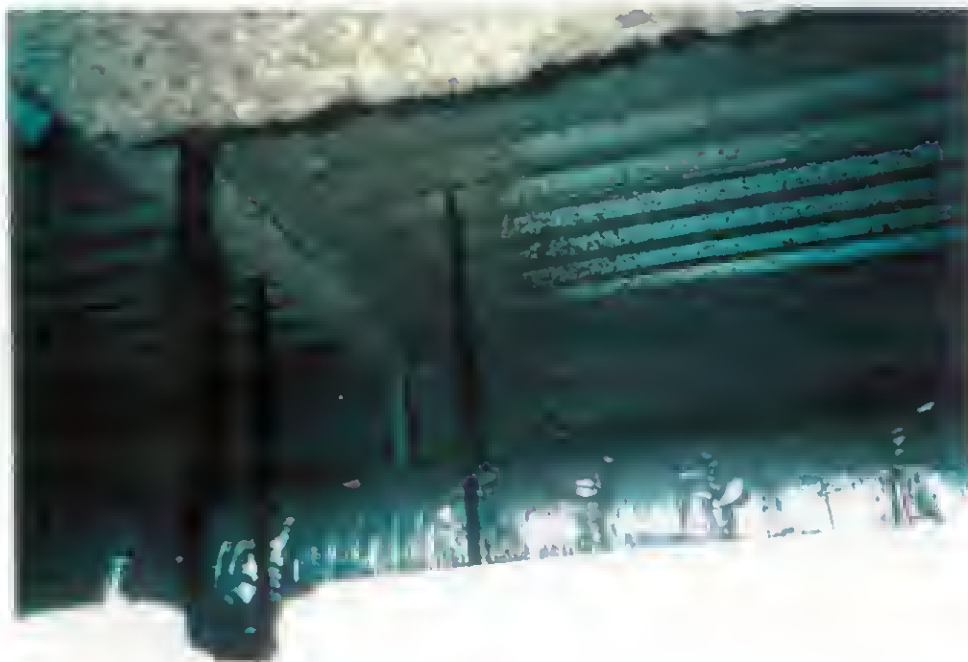
Photograph 4

Spray applied
fireproofing at
framing



Photograph 5

**Double girder
used on either
side of column to
frame cantilever**



Photograph 6

**Framing of
cantilever below
4th floor deck**



Photograph 7

Aluminum
cladding conceals
steel truss to
support
cantilever at 4th
floor overhang



Photograph 8

East and north
elevations



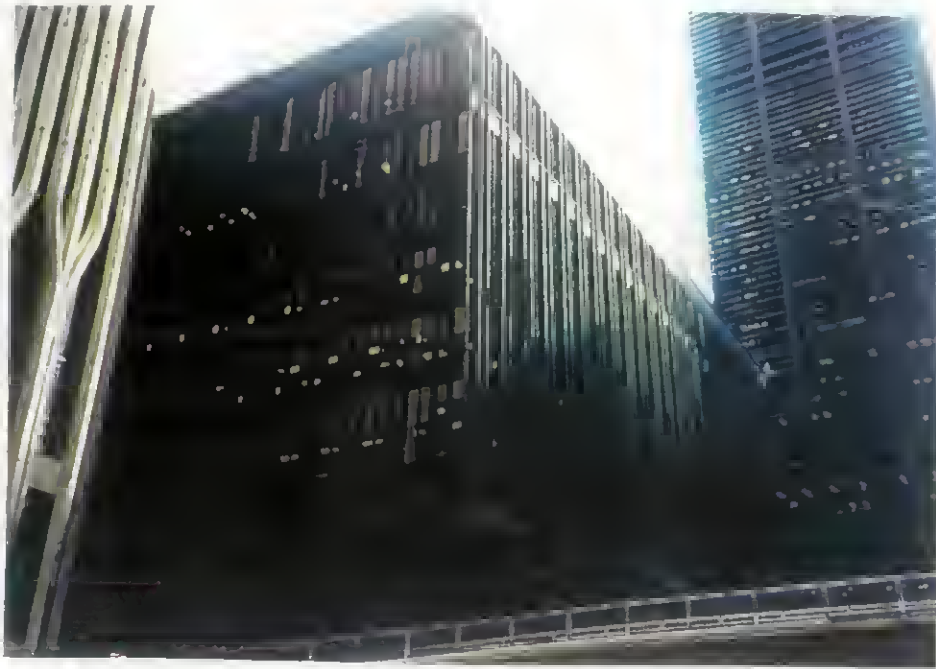
Photograph 9

North and west
elevations from
roof of 5WTC



Photograph 10

Supplementary
stair tower
added in 1995-96
to serve trading
room on 8th
floor



Photograph 11

West and south
elevations

X



Photograph 12

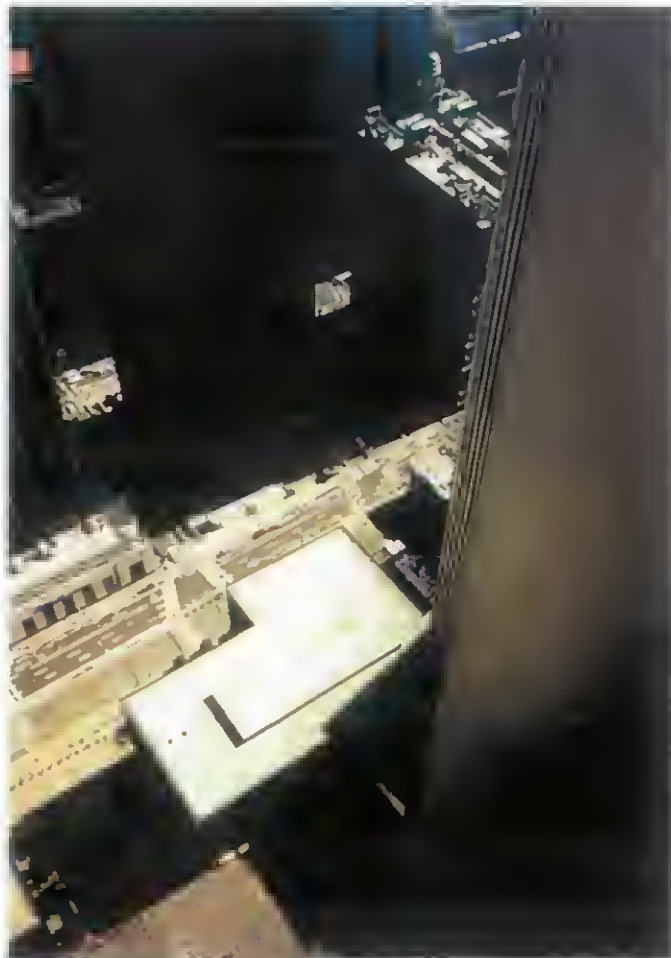
South and east
elevations



Photograph 13

**Detail of sill
condition at 4th
floor where
painted finish is
failing**

X



Photograph 14

**Roof layout
overview from
tower**



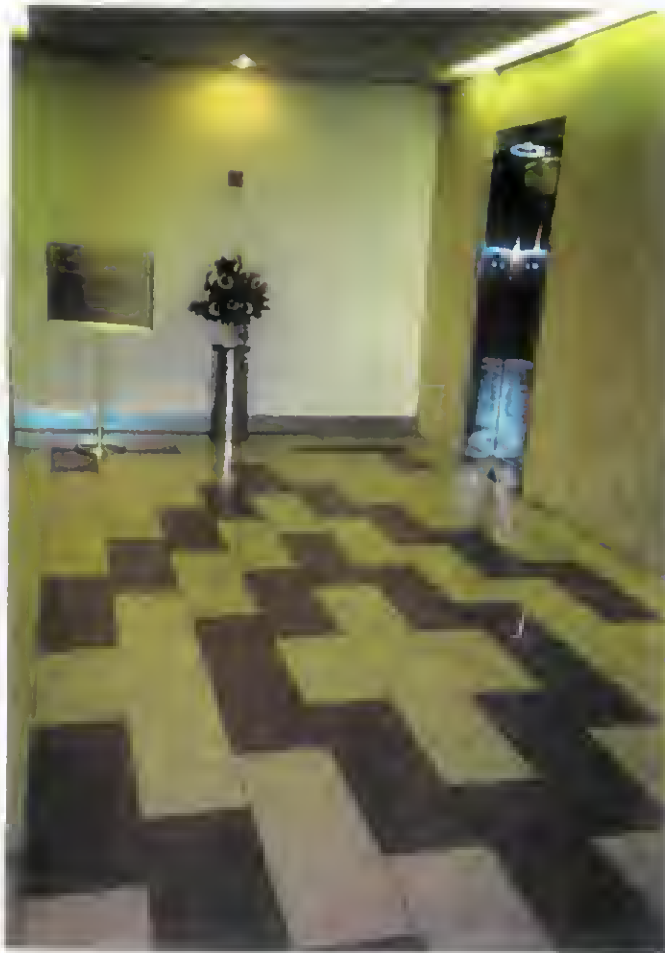
Photograph 15

Main field of roof with mechanical penthouse, window washing rig track and parapets visible



Photograph 16

Southeast stairway exiting into well at roof partially blocked by debris



Photograph 17

**Concourse level
elevator lobby**



Photograph 18

**Main entrance at
Plaza level from
Church Street.
Escalator at
right connects to
Concourse level**



Photograph 19

**Plaza level
elevator lobby**



Photograph 20

**Typical office
floor elevator
lobby**



Photograph 21

Office floor
corridor finishes



Photograph 22

Office space
along window
wall



Photograph 23

**Representative
office space**

X



Photograph 24

**Typical rest
room finishes**



Photograph 25

Typical rest
room finishes

o

x



Photograph 26

Stairway finishes



Photograph 27

**Mechanical
equipment room
finishes on 9th
floor**



Photograph 28

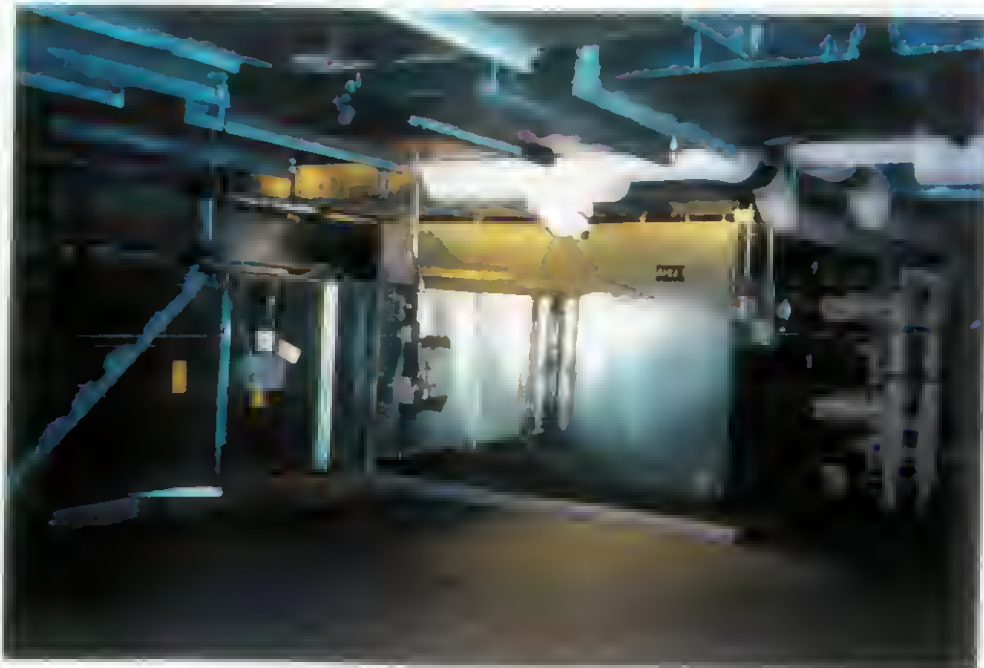
**Mechanical
equipment room
finishes on 9th
floor**



Photograph M1

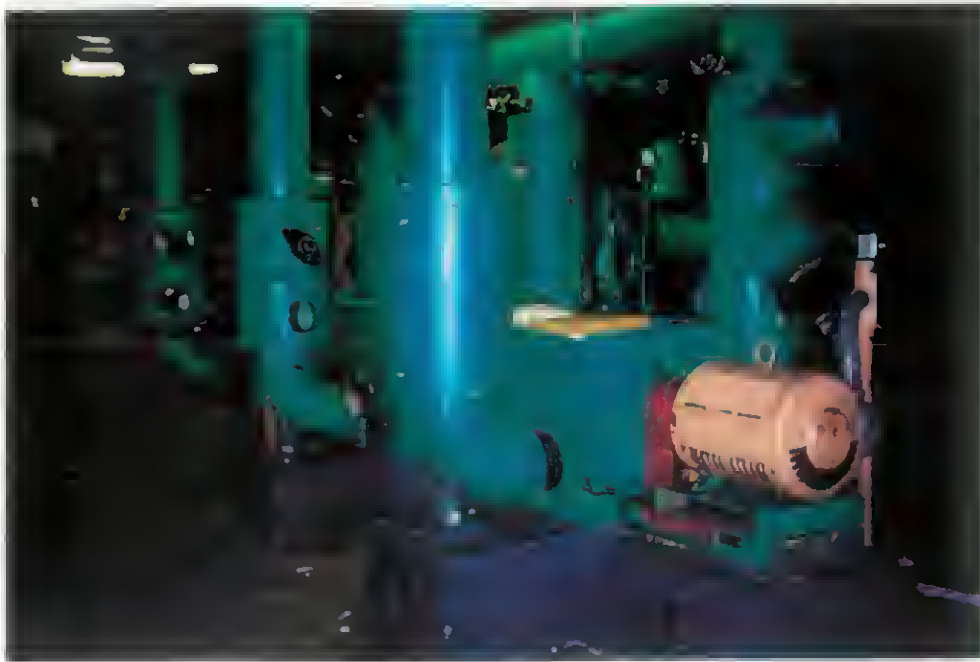
Typical perimeter
induction unit with
a chilled/hot water
coil

X



Photograph M2

Air handling unit
located in the
3rd floor
mechanical room



Photograph M3

**Chilled water
pumps located in
the B1
mechanical room**



Photograph M4

**Plate and frame
heat exchangers
for chilled water
located in the B1
mechanical room**



Photograph M5

Condenser water
supply and
return lines for
tenant
supplementary
air conditioning



Photograph M6

Heat exchanger
and circulating
pump for heating
hot water



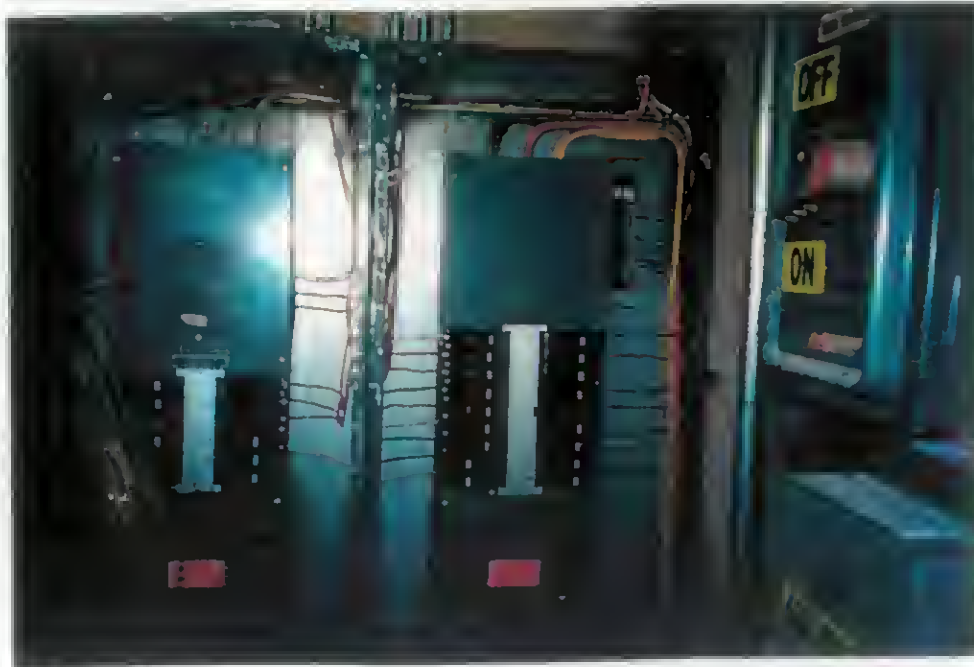
Photograph M7

**Ejectors and
tanks located in
the B1
mechanical room**



Photograph M8

**Steam domestic
water heaters
with circulating
pumps**



Photograph M9

Electric circuit
breaker panels in
a typical electric
closet

X



Photograph M10

Typical elevator
lobby without a
wall plaque
showing the
location of exit
stairs to be used
in the event of a
fire



Photograph M11

**Booster fire
pump located in
the 9th floor
mechanical room**

X



Photograph M12

**Variable
frequency drive
controllers for
the air handler
supply fans in
the 3rd floor
mechanical room**



Photograph 1

**Entrance pylon
at Church Street
Plaza entry**



Photograph 2

**Existing
structure at 8th
floor below the
MER. Spray-
applied
fireproofing and
rigid panel sound
insulation are
visible**



Photograph 3

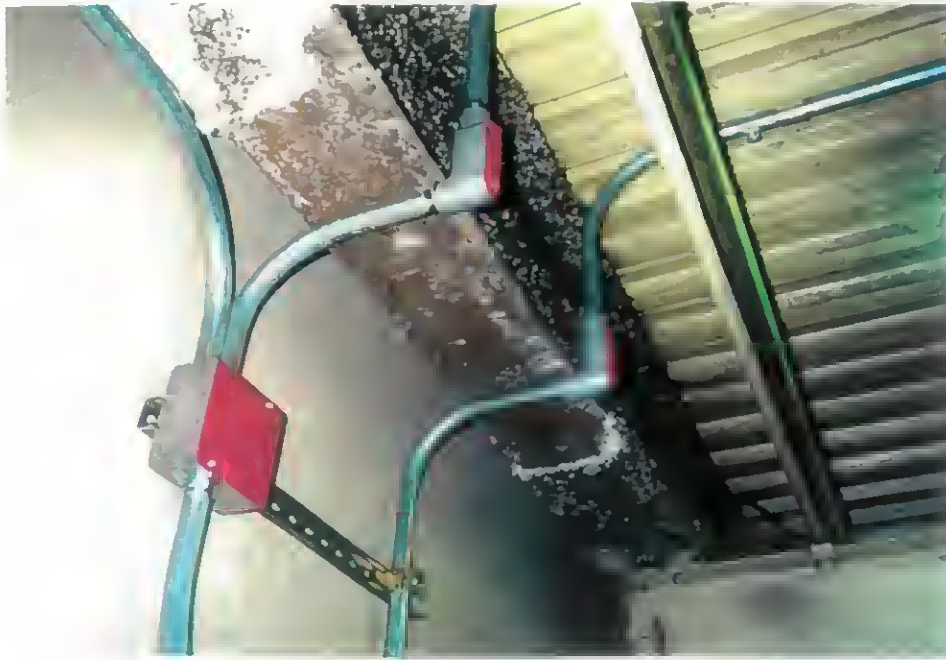
Roof deck
structure with
lally-column
supports of
exterior wall
visible at 9th
Floor MER

X



Photograph 4

Roof deck visible
at 9th Floor
MER Customs
House



Photograph 5

Example of spray applied fireproofing removed at framing for attachment of equipment



Photograph 6

Structure of B1 Level at loading docks which also services 4WTC



Photograph 7

East elevation



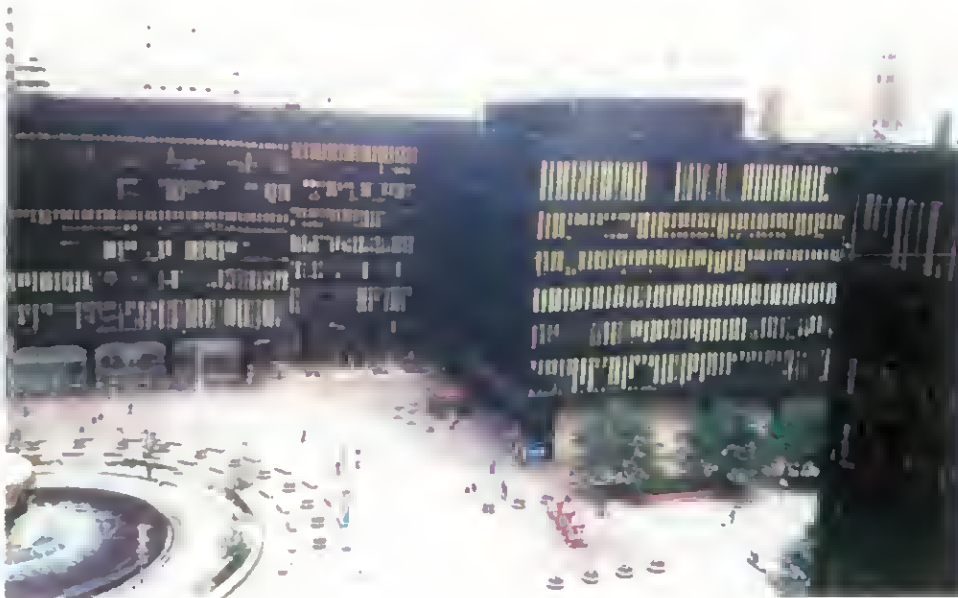
Photograph 8

Northeast corner
from Church
and Vesey
Streets



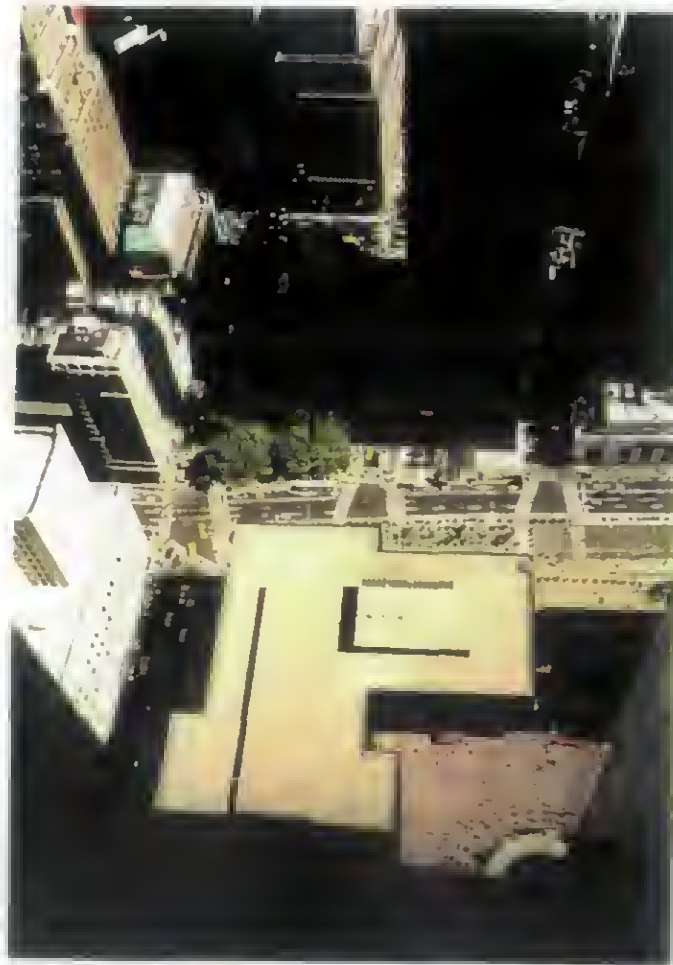
Photograph 9

North elevation



Photograph 10

South and west
elevations from
roof of 4WTC



Photograph 11

**Roof layout
overview from
tower**



Photograph 12

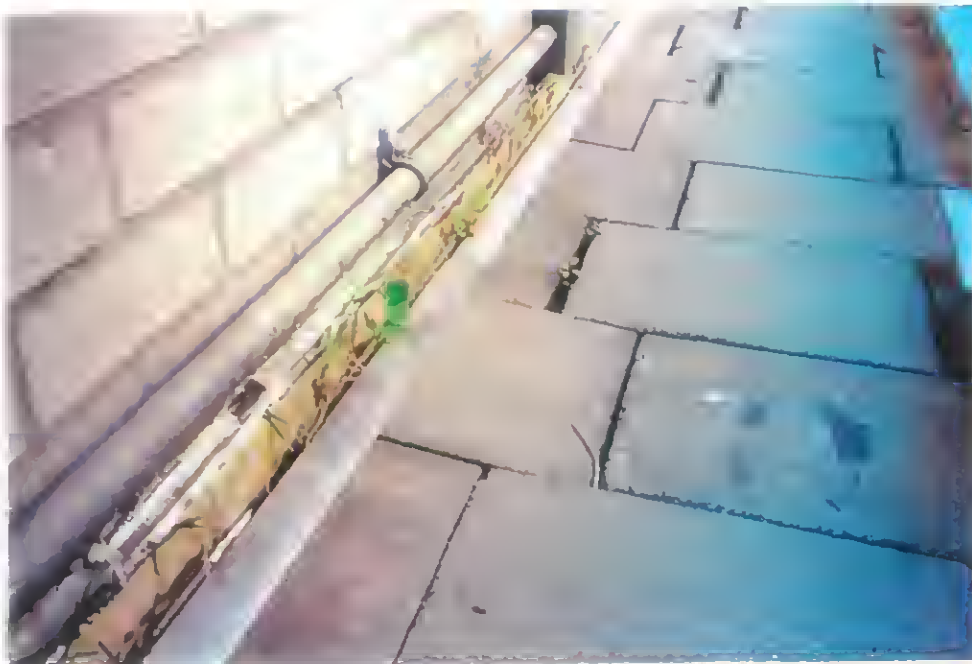
**Main field of
roof with
mechanical
penthouse,
window washing
rig track and
parapets visible**



Photograph 13

Detail of roof
drain with
vegetation
growth
supported by the
moisture held in
paver backing

X



Photograph 14

Detail of
perimeter
flashing detail
with vegetation
growth



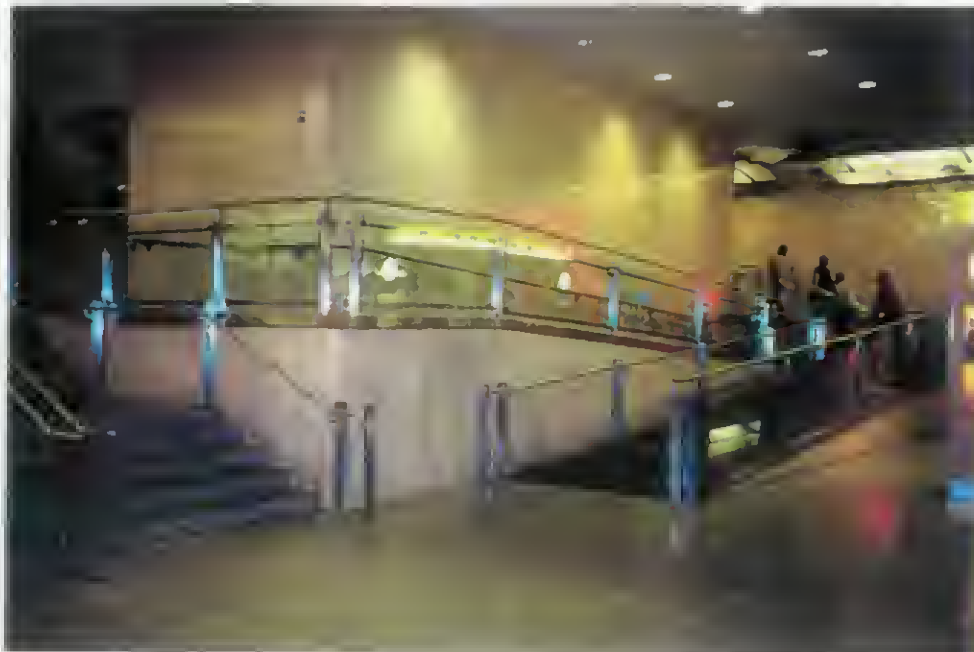
Photograph 15

**Penthouse roof
with pavers
removed for
patching of
membrane**



Photograph 16

**Severely rusted
underside of roof
deck from
previous roof
leaks**



Photograph 17

Concourse level
stair and ramp
entrance from
retail mall

×



Photograph 18

Concourse level
entrance



Photograph 19

Plaza level lobby

X



Photograph 20

**Office floor
corridor finishes**



Photograph 21

Office space
along window
wall



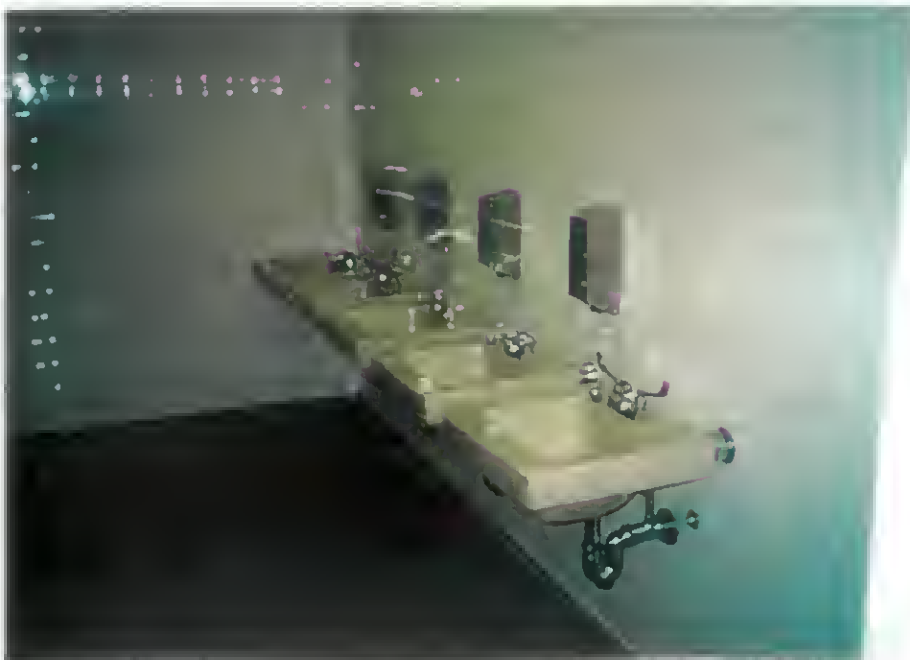
Photograph 22

Representative
office space



Photograph 23

**Typical rest
room finishes**



Photograph 24

**Typical rest
room finishes**



Photograph 25

Stairway finishes



Photograph 26

**Mechanical
equipment room
finishes on 9th
floor**



Photograph 27

Freight elevator
lobby finishes on
9th floor

X



Photograph 28

Stored debris
blocking
corridor on B1
level



Photograph M1

Typical air
handling unit
located in the
9th floor
mechanical
room

X



Photograph M2

Chilled water
supply line from
the central plant



Photograph M3

Typical return
air fan located in
the 9th floor
mechanical room



Photograph M4

Steam pressure
reducing station



Photograph M5

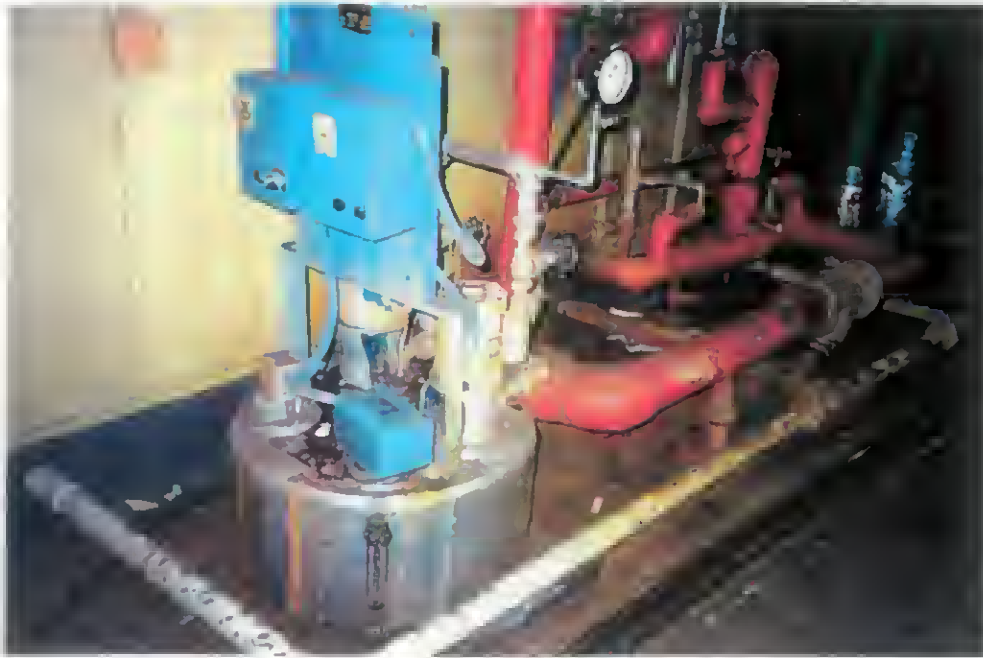
Secondary
chilled/heating
hot water pumps
located in the 9th
floor mechanical
room

X



Photograph M6

Heat exchangers
and circulating
pumps for
heating hot
water system



Photograph M7

Steam
condensate
pumps and
receiver

X



Photograph M8

Domestic water
supply pumps



Photograph M9

**Ejector pumps
and tank**

X



Photograph M10

**Steam domestic
water heaters
and circulating
pumps**



Photograph M11

Standpipe riser
with sprinkler
supply, and flow
and tamper
switches



Photograph M12

Typical office
floor corridor
with exit sign,
manual pull
station,
audio/visual
alarm, and fire
warden station



Photograph 1

River water pumps
in the remote
pumping station

X



Photograph 2

Traveling screen
filter for the
river water
system



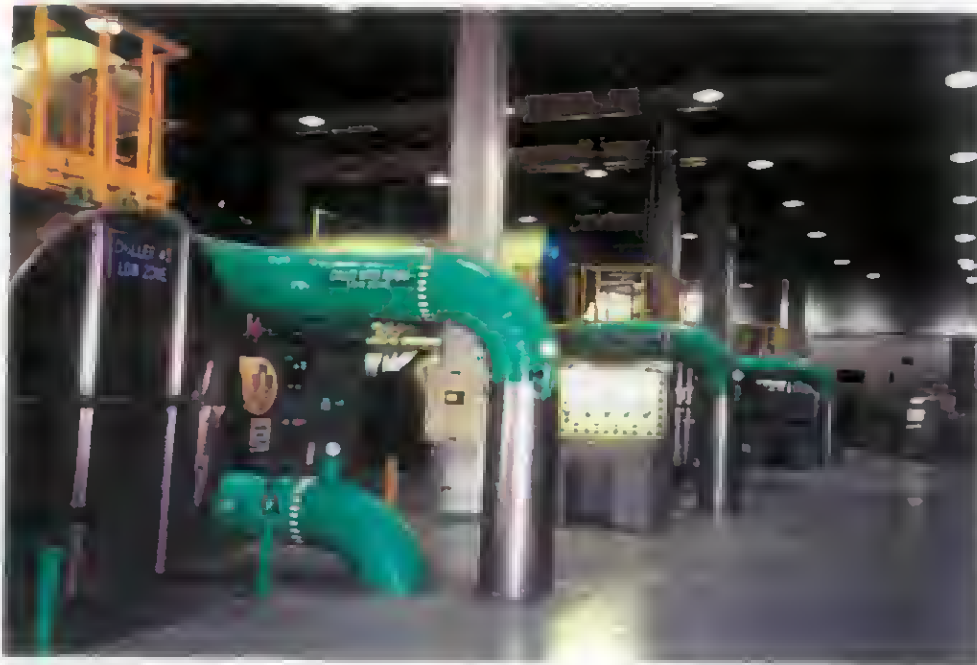
Photograph 3

River water
piping within the
complex



Photograph 4

River water
strainers for the
closed loop
condenser water
systems



Photograph 5

Main chiller #3



Photograph 6

Main chiller # 7
(split for high
and low zone)



Photograph 7

Chilled water
pumps



Photograph 8

High and low
zone chilled
water piping



Photograph 9

Supplemental
chillers

X



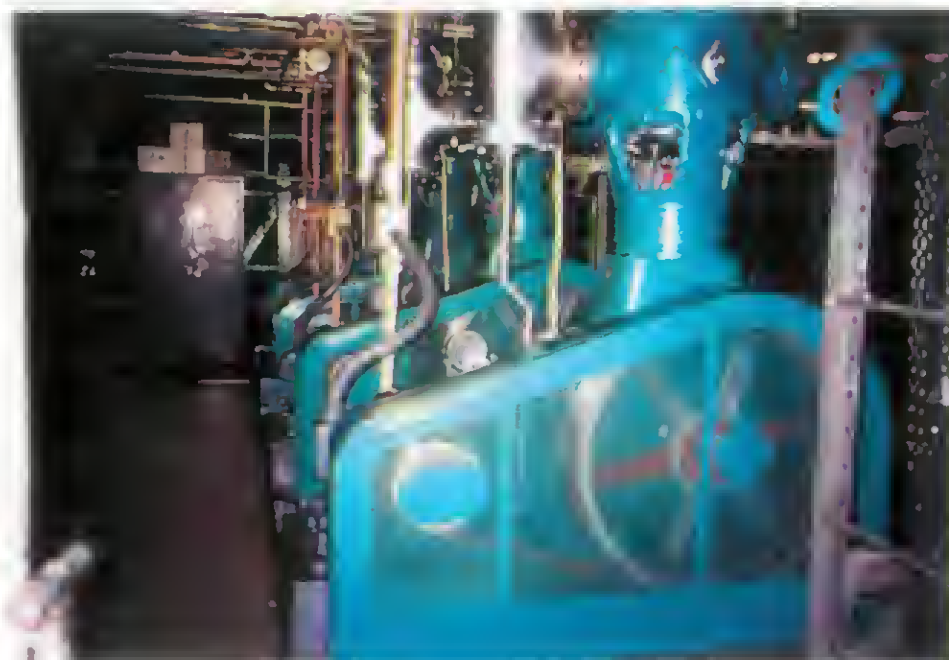
Photograph 10

Refrigerant
storage tanks



Photograph 11

Heat exchanger
for economizer
operation



Photograph 12

Pneumatic
control air
compressors



Photograph 13

Steam pipe rack



Photograph 14

Steam service
valve (planned
for replacement)



Photograph 15

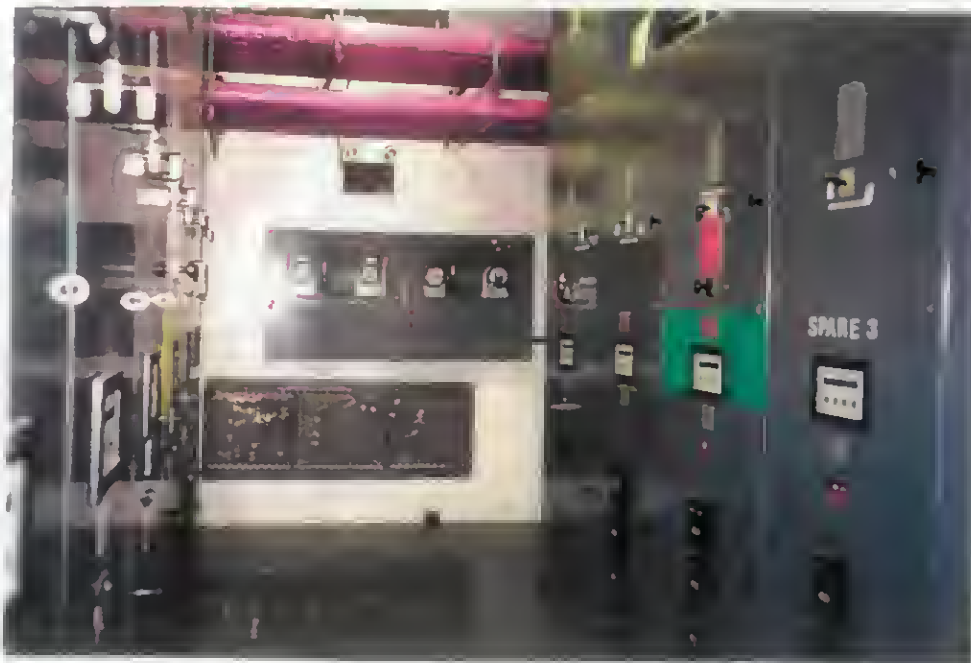
Steam
distribution
plant

x



Photograph 16

One of the main
water service
meters



Photograph 17

Switchgear
within the
Primary
Distribution
Center



Photograph 18

Recently
upgraded high
voltage feeders



Photograph 19

Upgraded
electrical
substation

X



Photograph 20

Electrical
distribution bus
ducts (new and
old) from a
substation



Photograph 1

Slurry wall exposed
in Level B5



Photograph 2

Base of slurry wall -
Level B6



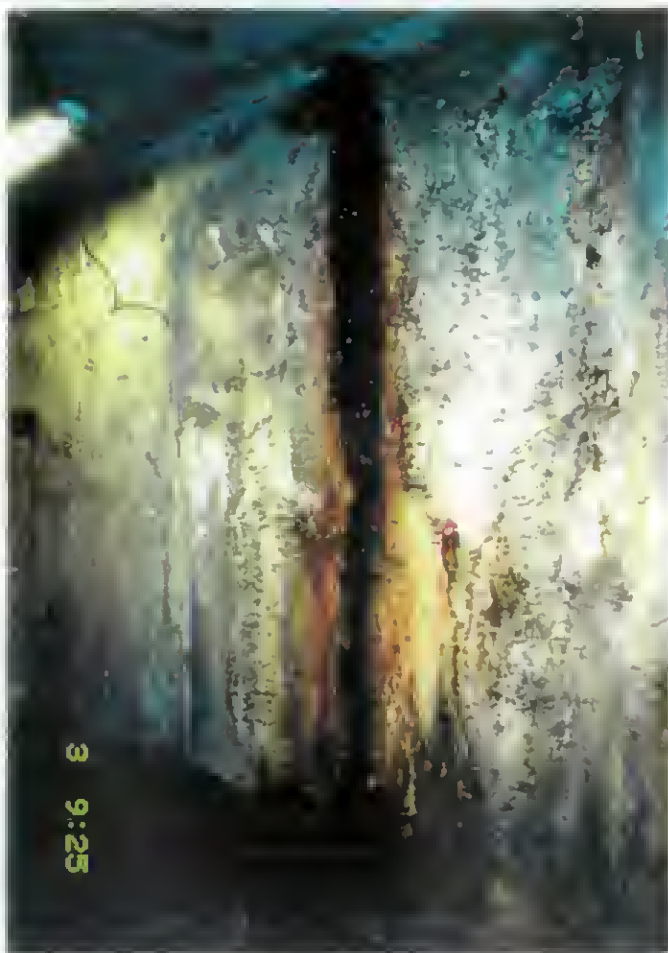
Photograph 3

Ceiling slab spalling at
slurry wall

Photograph 4

Ventilation
plenum typical -
runs along north,
east, and south
walls of garages
at Levels B2 - B4





Photograph 5

Leakage stains on
slurry walls

X

Photograph 6

Stains on slurry
wall and patches
for leaks





Photograph 7

Spalling garage
slab - Level 2, North



Photograph 8

Spalling slab in B5
Central Plant

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph 9

New slab being
installed in loading
dock area - start of
multi-stage program



Photograph 10

Loading dock area



Photograph 11

**Loading dock area
for US Customs
Buildings**



Photograph 12

**Missing fireproofing
at loading dock**

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph 13

Missing fireproofing
at ventilation
plenum - B2 North



Photograph 14

Missing fireproofing
at B-2 Garage

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph 15

Leased offices at
former parking area
(B1) for Marriott
Hotel



Photograph 16

Repairs of ceiling
slab at B2 ceiling
due to bomb
explosion

Subgrade (Parking & Storage Areas)

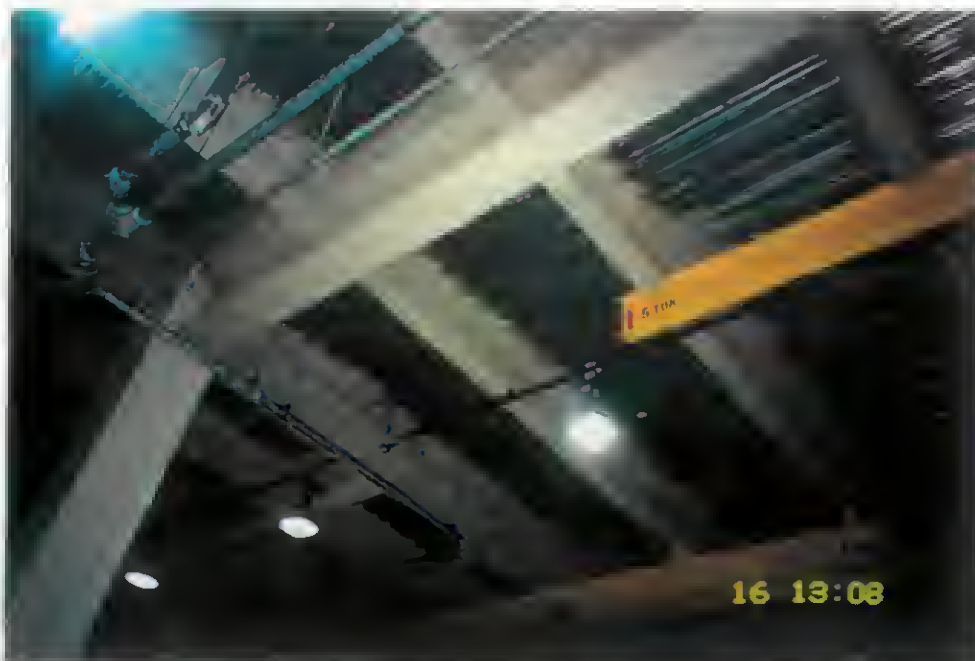
World Trade Center
New York, New York



Photograph 17

Repairs at column
brackets to support
weakened slabs

X



Photograph 18

New ceiling slab
installed above
refrigeration plant
due to bomb blast

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph 19

Ceiling under B4
ramp (south) in
ventilation plenum
requires repairs

X



Photograph 20

Level B2 slab
spalling (at ramp)



Photograph 21

Stair in projection
serves as PATH
emergency exit

X

Photograph 22

Typical subgrade
stair requires
cleaning and
some require
painting



Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph 23

B5 and B6 storage
spaces

X



Photograph 24

B4 northeast stair
door being replaced

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph M1

Heating and
ventilating unit in the
loading dock area

X



Photograph M2

Window style air
conditioning unit
used in the parking
office



Photograph M7

**Tenant air-cooled
condensers in the
northwest projection
area**

X



Photograph M8

**Tenant emergency
generator in the
northwest projection
area**



Photograph M9

Typical sewage
ejector pit

X



Photograph M10

Pumps within an
ejector pit

Subgrade (Parking & Storage Areas)

World Trade Center
New York, New York



Photograph M11

House traps within
subgrade space



Photograph M12

High voltage
electrical duct banks
painted purple
within the subgrade
space



Photograph M13

Life safety devices
within a subgrade
storage area

X



Photograph M14

Sprinkler head in
the loading dock
area observed to be
painted